
0.1 0.2 0.5 1.0 2 5 10 20 50 100 200 500 1000
BATT MIN
CAL
rad/hour

Army Code No
61503
(1976)
A/70/MISC/2671

USER HANDBOOK
for

RADIACMETER
(PORTABLE DOSE RATE METER)

Nato Stock No 6665 - 99 - 119 - 8766

WARNING

This instrument contains radioactive materials. The user should read the full warning notice on page iii carefully.

Published under the authority of:-
ASSISTANT CHIEF OF THE GENERAL STAFF
(OPERATIONAL REQUIREMENTS)
Ministry of Defence
S.W.1

Prepared by
QUALITY ASSURANCE DIRECTORATE (WEAPONS)
WOOLWICH LONDON
S.E.18 6ST

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AMENDMENT RECORD

AL number	Date of incorporation	Signature	AL number	Date of incorporation	Signature
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2			32		
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WARNING

THE PORTABLE DOSE RATE METER CONTAINS A SMALL RADIO-ACTIVE CALIBRATION SOURCE, TWO SMALL GASEOUS TRITIUM LIGHT SOURCES AND A PRESSURIZED IONIZATION CHAMBER. IN NORMAL CONDITIONS OF USE THERE IS ADEQUATE PROTECTION FOR THE OPERATOR FROM THESE COMPONENTS. THE OPERATOR MUST NOT HOWEVER, UNDER ANY CIRCUMSTANCES, OPEN THE INSTRUMENT AND RISK EXPOSING THEM TO DAMAGE. IF THE INSTRUMENT CASING OR THE WINDOW OF THE INDICATING METER IS BROKEN, CARE SHOULD BE TAKEN TO AVOID:

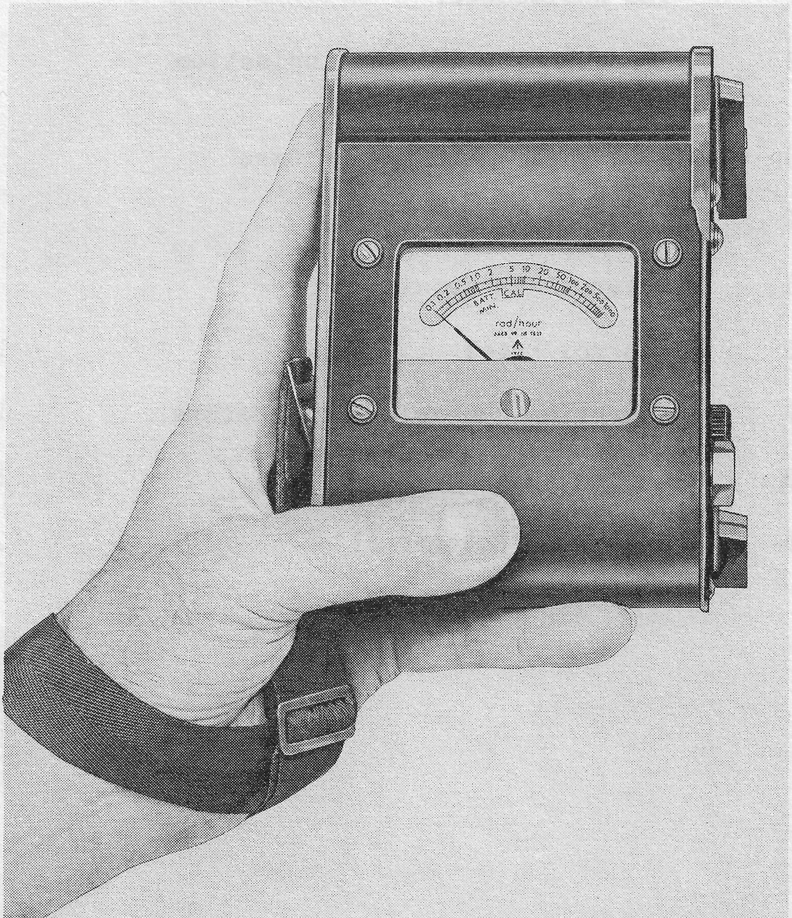
a. EXPOSURE TO, OR DIRECT CONTACT WITH, THE CALIBRATION SOURCE, PARTICULARLY OF THE EYES.

b. BURSTING THE THIN DOMED BETA WINDOWS OF THE IONIZATION CHAMBER.

c. BREAKING THE LIGHT SOURCES.

NORMALLY A DAMAGED INSTRUMENT SHOULD BE SECURED IN ITS HAVERSACK OR OTHER SUITABLE CONTAINER (A METAL BOX, FOR PREFERENCE) AND DISPOSAL INSTRUCTIONS OBTAINED.

CONTENTS


BATT
CAL
rad/hour

INTRODUCTION

PURPOSE AND FUNCTION

101. The Radiacmeter (Portable Dose Rate Meter) Nato Stock No 6655-99-119-8766 is a small, lightweight, battery-operated instrument which measures gamma dose rates between 0.1 and 1000 rad/hour. It can also give an indication of the presence of beta particles from radioactive fall-out or neutron induced radioactivity.

102. The instrument is easy to operate and has a single range scale. A small radioactive source is fitted for user calibration. The battery used for the power source provides for at least 90 hours continuous operation at normal ambient temperatures and its condition can be checked at any time by means of the internal "battery check" facility.

103. A protective carrying case is used when monitoring gamma radiation, the case being supported on the chest or from the shoulder. When monitoring beta, the meter may be hand-held, making use of the wrist strap which is fitted, then carried in a pocket of the uniform when not in use.

PHYSICAL DESCRIPTION

104. The instrument (see Fig 1) has a sealed case made from a light alloy casting, with the meter set in the upper face and the controls and desiccator located on the right-hand side. The battery compartment is on the other side of the instrument.

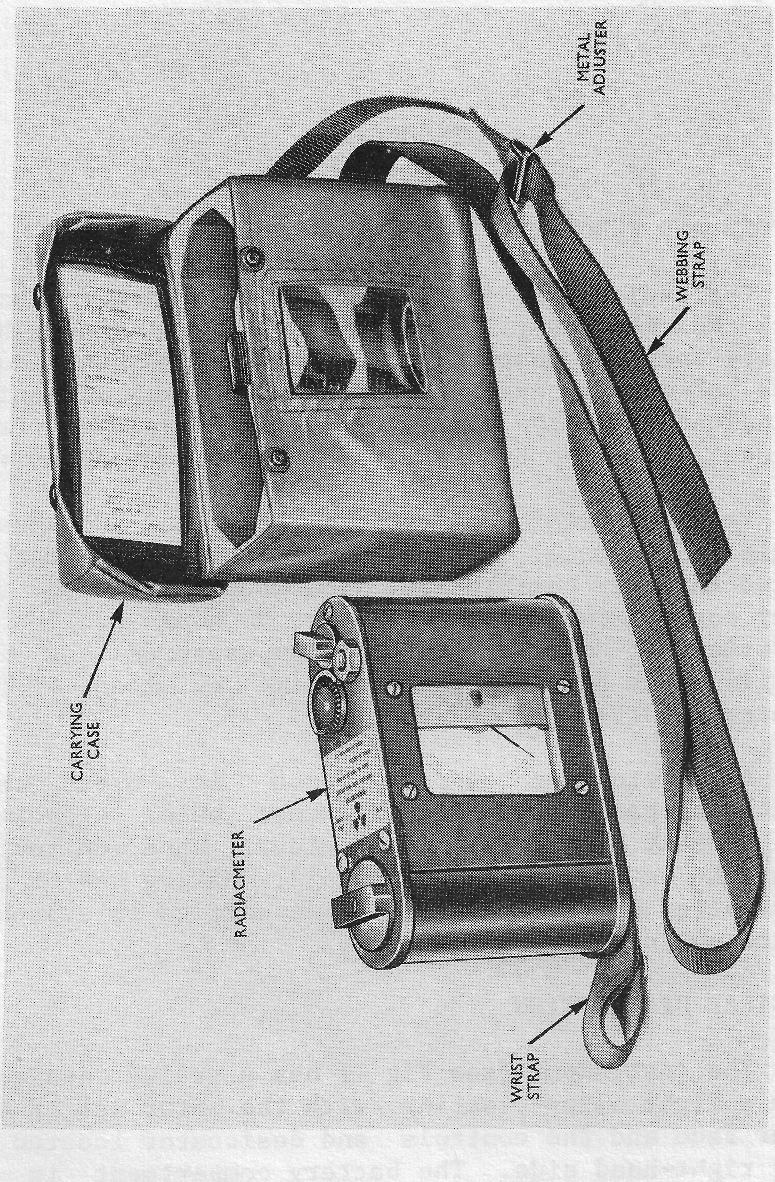


Fig 1 The Radiacmeter

105. Figure 2 shows the internal construction of the unit. An ionisation chamber with an electrometer valve supported at its centre, is mounted concentrically inside a stainless steel cylinder. The cylinder is turned by means of a control attached to it, in order to select the function of the instrument. An outer case or shield is fitted over the cylinder and this contains a small radioactive source.

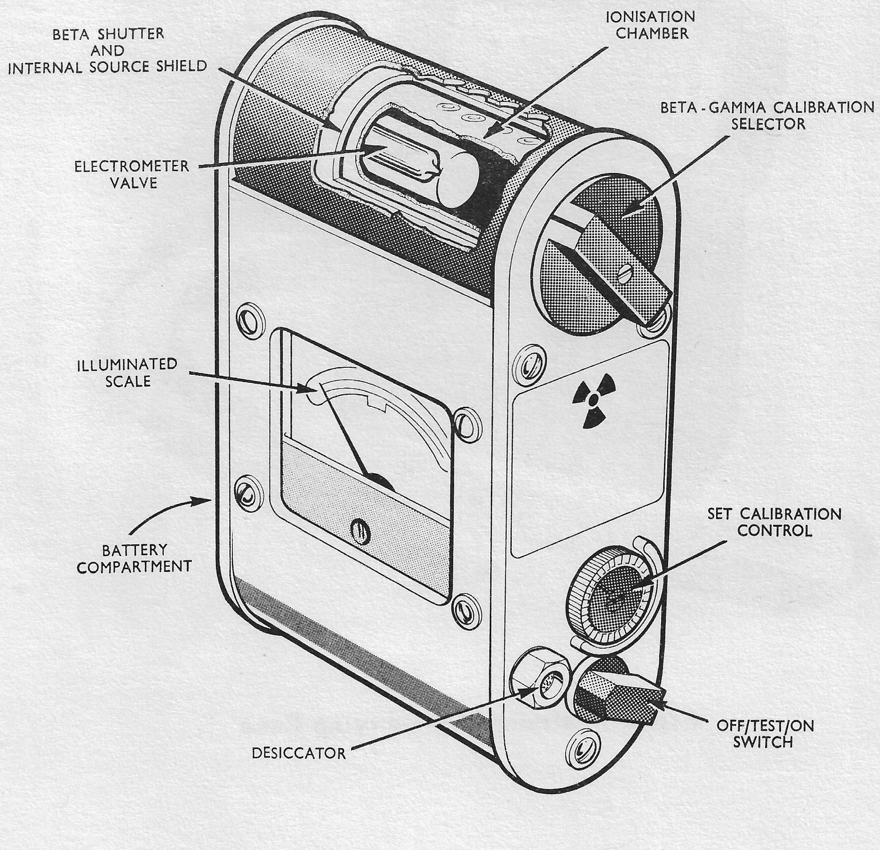


Fig 2 General view showing Ionisation Chamber details

106. When the instrument is used in its carrying case, it is fitted to allow the controls to be operated easily and permit the meter to be read through the clear plastics window, (see Fig 3). Brief operating and calibrating instructions are printed on a card inside the cover of the carrying case.

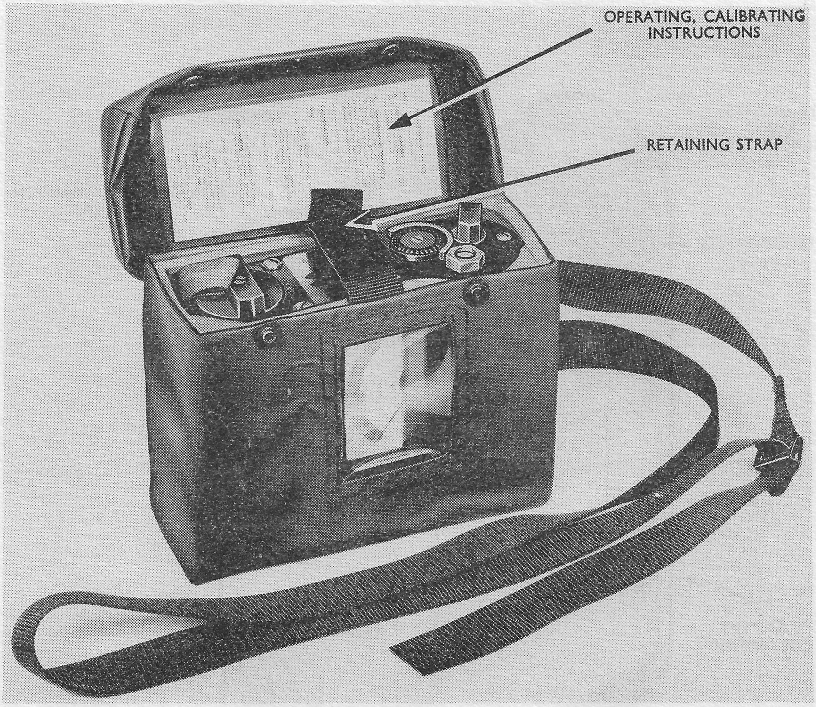


Fig 3 Instrument in Carrying Case

ELECTRICAL AND PHYSICAL DATA

107. Electrical Data

Range Scale	Gamma	A single logarithmic scale over four decades, (with a CAL mark at 5 rad/hour), from 0.1 rad/hour to 1000 rad/hour, for radiation energies between 80keV and 3MeV.
	Beta	1 microcurie/cm^2 of P^{32} (E max - 1.7MeV) uniformly distributed over 100cm^2 will cause the meter to indicate at least 0.1 rad/hour when the instrument's beta windows are brought to within 2cm from the contaminated surface.
Instrument Accuracy *(excluding the effect of Energy and Polar Response and Temperature Dependence)		Errors do not exceed $\pm$20% of true reading or $\pm$50 millirad/hour whichever is greater, provided the instrument has been allowed to remain switched on for more 60 seconds.
*Energy Response Gamma		Within +40% of true dose rate from 80keV to 3000keV, and within $\pm$20% from 0.3MeV to 3MeV.
*Polar Response Gamma		Within 20% of response to Ra^{226} in the forward direction along the axis of the instrument (datum), for all angular displacements up to 120° in any plane.

*Temperature Dependence	Errors do not exceed ±8% of true reading between −20 degrees C and +52 degrees C.

(The instrument will continue to operate at a reduced accuracy, between −31 to −20 degrees C and +52 to +65 degrees C.)

Response Time	The instrument will indicate within 10% of the final reading within 3 seconds of the onset, or change, in radiation.
Power Supply	Battery B1. 2.7V mercury cell (Nato Cat No 6135-99-618-2952) (Life: At least 90 hours at +20 degrees C. At least 24 hours at −20 degrees C.)
	Battery B2. 1.35V mercury cell (Nato Cat No 6136-99-433-5404)

108. Physical Data

Dimensions	Instrument (overall) 16.6cm x 12.6cm x 5.4cm (6.5in x 4.95in x 2.125in)
	Carrying Case (overall) 18.4cm x 14.6cm x 7.6cm (7.25in x 5.75in x 3in)
Weight (Instrument only)	1.16kg (2 lb 9 oz)
Weight (Instrument in carrying case, c/w batteries)	1.52kg (3 lb 6 oz)

PRINCIPLES OF OPERATION

GENERAL

201. The portable dose rate meter consists basically of an ionisation chamber, an amplifying stage which magnifies the effect of the radiation being detected and a suitably calibrated indicating meter (see Fig 4). Power for the ionisation chamber and amplifier is supplied by a small battery, via converter and stabilizer circuits.

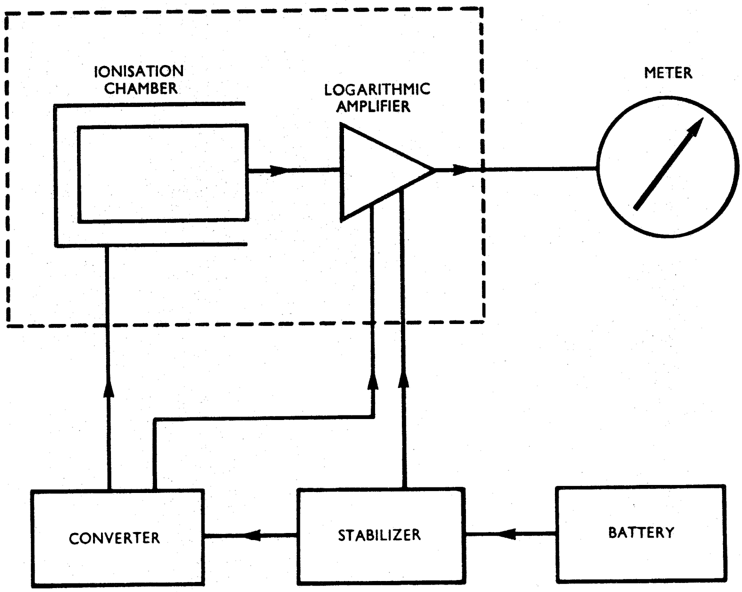


Fig 4 Block Diagram

CIRCUIT DESCRIPTION

202. Radiation falling on the ionisation chamber produces a very small electrical current whose value is proportional to the amount of the radiation (the dose rate) being measured. This is fed to a "logarithmic amplifier" consisting of an electrometer valve and associated components, which amplifies the current to a level which can be read by the indicating meter. The type of amplifier used enables the instrument to cover a wide range without switching being necessary and the meter has a single logarithmic scale embracing the whole four decade range, ie from 0.1 rad/hour to 1000 rad/hour (see Fig 5).

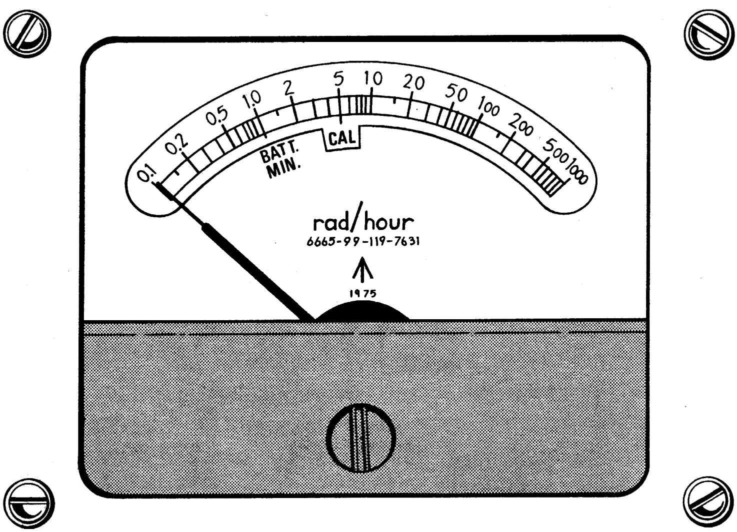


Fig 5 Meter Scale details

203. The ionisation chamber has to be "polarized" with a high dc voltage before it will respond to the radiation to cause a flow of current. The voltage is obtained from the converter circuit, basically a transistor oscillator, and developed from the very stable output of the stabilizer unit. The converter also provides a stabilized supply for the electrometer valve. This ensures that both the ionisation chamber and the electrometer valve operate from supplies which, within limits, are unaffected by variations in battery voltage or load changes and the calibration of the instrument stays substantially constant.

204. Gamma radiation is detected whether the ionisation chamber selector control is set at GAMMA or BETA (see Fig 6); but a combined gamma plus beta indication is obtained if the control is set at BETA. This is because the beta shutter is opened, leaving only the thin-walled windows in the ionisation chamber which thus allow beta particles to enter. The presence of beta is indicated by subtracting the reading at GAMMA from that at BETA.

205. The third position of the ionisation chamber selector control is CAL. This opens the shield between the ionisation chamber and the radioactive source, permitting the instrument to be checked and adjusted for correct calibration. The radioactive source simulates a gamma dose rate of 5 rad/hour, which is marked as CAL on the meter scale (see Fig 5). Any ambient (external) gamma radiation is also detected in the CAL position. In the absence of external radiation the SET CAL control is used to set the meter needle to the CAL mark. If, however, the calibration is carried out in the presence of a gamma radiation field, account is taken of the dose rate from the external source. Paragraph 402 details the procedure for calibrating the instrument.

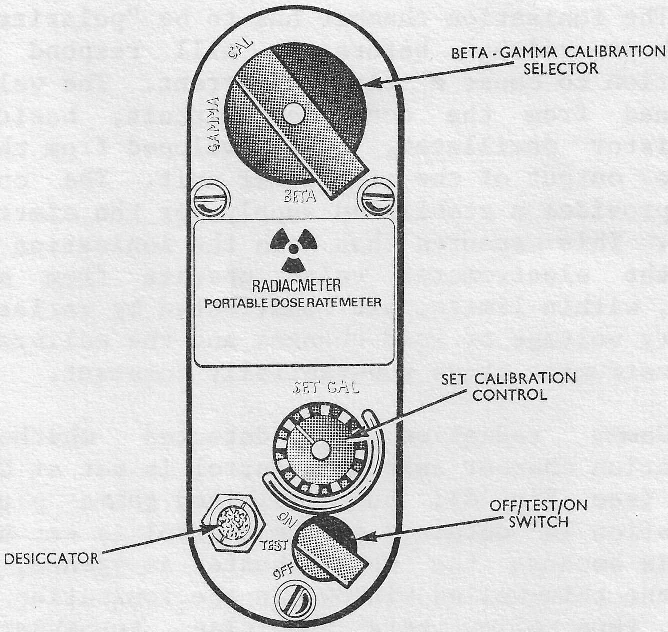


Fig 6 Control Panel

206. The other control on the dose rate meter is an ON-OFF switch with an intermediate TEST position. This enables the operator to check the state of the battery B1 which is used to power the instrument. When the switch is at TEST the circuit is energized and the meter is connected to monitor the voltage of the battery under load conditions. A BATT MIN line on the meter scale indicates the minimum working voltage.

207. A second battery, designated B2, is fitted to the instrument, its function being to act as a "reference cell" in the stabilizer unit. As the amount of current drawn from the battery is very small its voltage is expected to remain stable over a long period and no provision is made to check it in the way B1 is checked.

CONTROLS AND INDICATORS

GENERAL

301. The following paragraph describes the purpose of the switches etc used in setting up and operating the equipment. Only external controls are listed, internal preset controls are not of user concern and are not detailed.

302. Controls and Indicators (see Fig 7)

CONTROL etc	FUNCTION
OFF-TEST-ON 3-position rotary switch SA	a. OFF. Disconnects all power and shorts the meter M1 to protect it from shock eg during transit. b. TEST. Circuit is energized and meter M1 is connected to monitor voltage of battery B1 on load. c. ON. Normal operating and calibrating position with meter M1 connected into circuit.
BETA-GAMMA-CAL 3-position selector control, rotatable cylinder	Used to open or shut the beta shutter and internal source shield. a. BETA. Allows the admission of beta particles (and gamma radiation) into the ionisation chamber by opening the beta shutter.

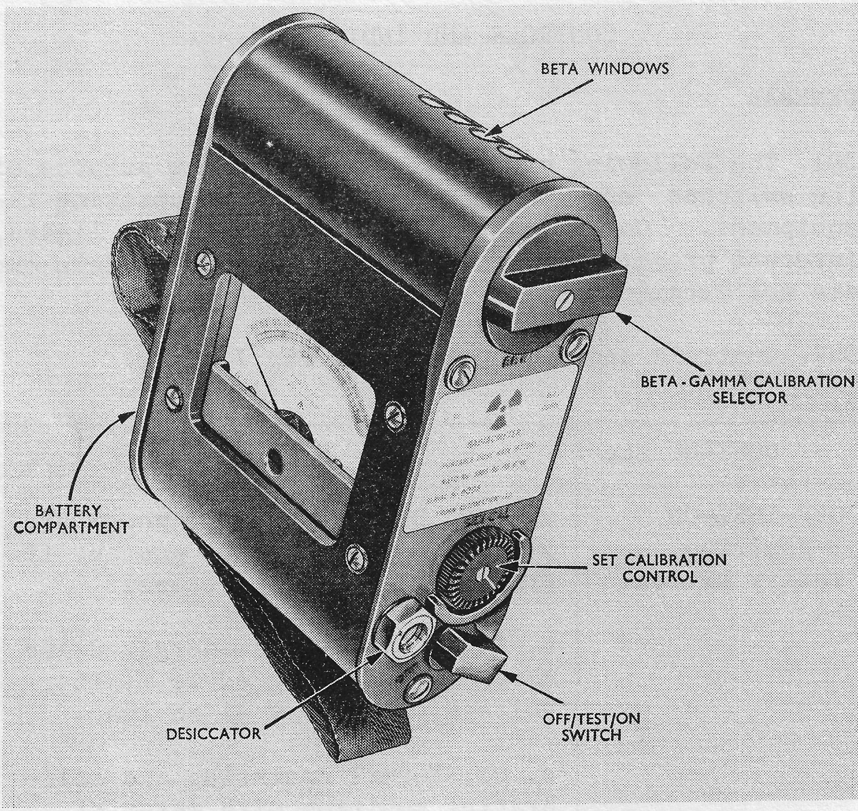


Fig 7 Operating Controls & Indicators

302. (Contd)

CONTROL etc	FUNCTION
	b. GAMMA. Allows the admission of gamma radiation only, into the ionisation chamber, by closing the beta shutter. c. CAL. Position used when calibrating instrument. Opens the shield to allow known radiation from source to enter ionisation chamber and deflect meter pointer to give predetermined calibration reading.
SET CAL: potentiometer	Preset control used in conjunction with selector switch as above (c), during calibration procedure.
DESICCATOR: tell-tale indicator	Indicates the presence (or otherwise) of dampness within the unit.

GUIDE TO OPERATION

INTRODUCTION

401. This chapter describes how to test, user calibrate and operate the instrument. Brief instructions are also given on the plasticised card stitched into the cover of the carrying case. Full calibration is the responsibility of REME and does not concern the user. For optimum accuracy the dose rate meter should be switched on at least 1 minute before it is required for use and the calibration procedure should be carried out if the environmental temperature has changed by more than 10°C or the unit has been subjected to mechanical shock since the last calibration. Readings taken after 10 seconds of switching on will give approximate readings (to within ±40% of true value).

PRELIMINARY TESTS AND ADJUSTMENT OF CALIBRATION (see Fig 7)

402. Before use the following procedure must be carried out, in sequence, to take account of the presence of any external gamma radiation field.

a. Switch the OFF-TEST-ON switch to TEST. Check the meter reads above the BATT MIN line. If not, replace battery B1 as detailed in Chapter 5 and re-check.

b. Set the BETA-GAMMA-CAL control to CAL and the OFF-TEST-ON switch to ON. Wait 60 seconds then note the meter reading.

c. If the reading is less than 5 rad/hour, adjust the SET CAL control to bring the reading to the 5 rad/hour CAL line. If the reading is more than 5 rad/hour do not make any adjustment to the SET CAL control but note the reading.

d. Switch the BETA-GAMMA-CAL control to GAMMA and note the reading. If the CAL reading at c. is exactly 5 rad/hour higher than this GAMMA reading, the instrument is correctly adjusted and ready for use.

e. If the CAL reading at c. is less than 5 rad/hour higher than the GAMMA reading, adjust the SET CAL control to give a higher CAL reading. Repeat checks until the CAL reading is exactly 5 rad/hour higher than the GAMMA reading.

f. If the CAL reading at c. was more than 5 rad/hour higher than the GAMMA reading, adjust the SET CAL control to give a lower CAL reading, but not below 5 rad/hour. Repeat checks until the CAL reading is 5 rad/hour higher than the GAMMA reading.

g. The instrument is now ready for use. However,

h. If the user is unable to obtain a CAL reading which is 5 rad/hour higher than the GAMMA reading or if the difference cannot be judged, the SET CAL control should be set so that the inscribed marks on the control and on the panel are aligned. The meter readings will then be approximately correct in operation.

MONITORING GAMMA RADIATION

403. The dose rate meter should preferably be operated whilst in its carrying case as protection against possible damage. Maximum accuracy is obtained if the instrument is held with the meter scale horizontal to, and 1 metre above, the ground. Reading errors up to nine per cent of the indicated value may be experienced if this is not done. For monitoring areas where "hot spots" are suspected, the instrument should be pointed in the direction of the radiation. This will reduce errors which could be caused by the operator shielding some of the radiation from reaching the meter and errors resulting from the polar response of the instrument.

404. The procedure for monitoring gamma radiation is, simply,

a. Carry out tests and user calibration as detailed in para 402.

b. Set the OFF-TEST-ON switch to ON, and the BETA-GAMMA-CAL control to GAMMA.

c. Read off the value of gamma radiation indicated on the meter.

MONITORING BETA RADIATION

405. The instrument is removed from its carrying case and held in the hand when monitoring BETA radiation. The operating procedure is as follows:

a. Check the gamma background radioactivity as detailed in para 404 and note the reading.

b. Set the BETA-GAMMA-CAL control to BETA. Hold the instrument so that the beta windows at

top of the case (see Fig 8) are about 1cm to 3cm from the surface to be monitored. Note the reading. Care must be taken to avoid touching the item being monitored, as this could cause physical contamination of the instrument and the risk of obtaining inaccurate readings.

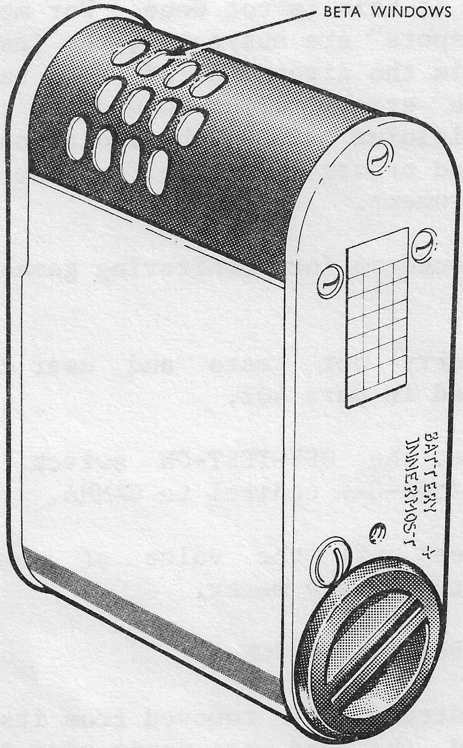


Fig 8 The Beta Windows

c. Subtract GAMMA reading from BETA reading and apply the following conversion factor to obtain the approximate level of contamination:

$$1 \text{ rad/hour} = 10 \text{ micro-curies/cm}^2$$

406. The distance at which the instrument is held from a contaminated surface is significant because it affects the area "seen" by the detector, also the sensitivity of the instrument to beta radiation. For example, the area seen at 2cm is at least 100cm^2. Then, where the area is uniformly contaminated the fall off in sensitivity is approximately 20% if the distance is increased by 50% ie from 2cm to 3cm. However, where the contamination is not uniform, eg in crevices of clothing, the area of this "hot spot" is likely to be less than 100cm^2 and sensitivity increases significantly as distance is reduced. The probability of detecting such hot spots may be improved by operating the unit inside a thin polythene bag and "frisking" very close to the contaminated surface. The bag, of a thickness not greater than 0.002in (about 6mg/cm^2), will protect the instrument from contamination and may be replaced as necessary.

SERVICING

GENERAL

501. The operator is not required to service and must not attempt to repair or replace any parts if they become damaged or if the function of the instrument is suspect, but should report the failure to REME. The only maintenance, apart from attention to cleanliness, which the operator is required to perform, is to replace battery B1 as necessary. A cautionary note appearing under para 503 below refers to battery B2 but no instructions are given about replacing the battery as this is a REME task.

REPLACEMENT OF BATTERIES

502. Battery B1. This is replaced when the meter reading at the TEST position of the OFF-TEST-ON switch falls below the red BATT MIN line. Proceed as follows:

a. Set the OFF-TEST-ON switch to the OFF position.

b. Unscrew the battery compartment cover anti-clockwise, using a suitable coin or the carrying case strap buckle.

c. Lift the top contact on its flying lead clear of the battery and tip the battery out of the compartment (see Fig 9).

d. Insert a new battery B1, positive end first (marked +) into the battery compartment. Replace the top contact.

e. Locate the dimpled centre of the battery cap (complete with the battery cap 'O' ring) into the top contact and screw up tightly.

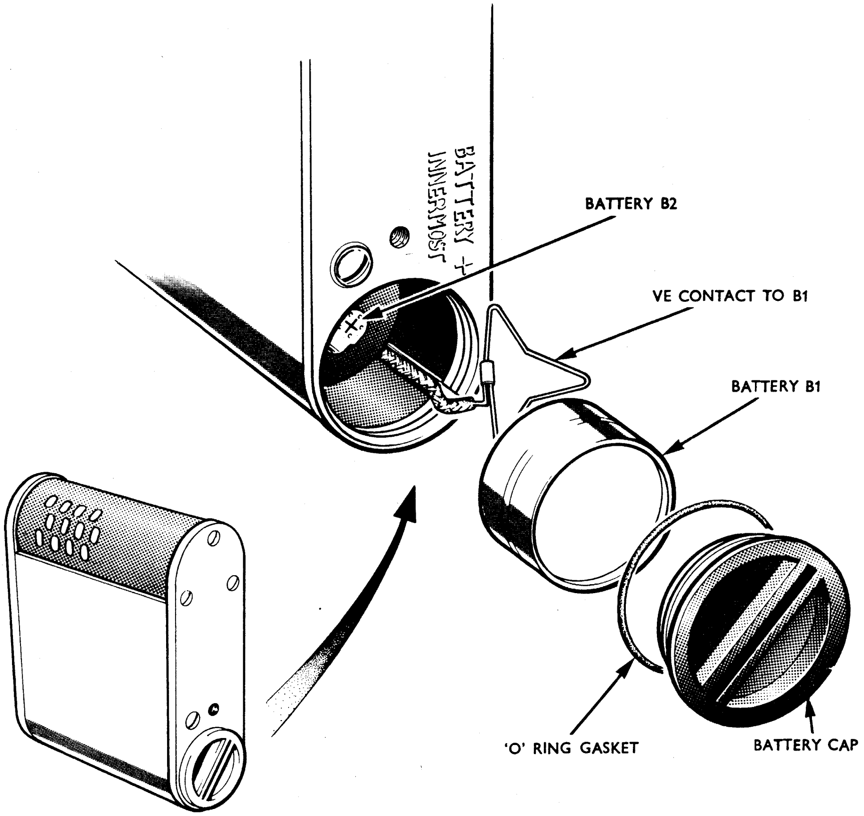


Fig 9 Replacing Battery B1

503. Battery B2. This is replaced by REME when the instrument receives a full calibration check, and does not concern the user. It should, however, be borne in

mind that the battery life can be affected, or shortened under the following condition. If the instrument is left switched on for prolonged periods when battery B1 has expired or has been removed and not replaced, this reduces the life of battery B2 from an expected "shelf life" of 2 years to approximately 6 weeks (not less than 1000 hours). The user should therefore inform REME when this happens, so that the suspect battery can be replaced.

REPLACEMENT OF DESICCATOR

504. The desiccator requires replacement if the colour of the tell-tale indicator changes from blue to pink and the user should inform REME when a new desiccator needs fitting.

CLEANING

505. The instrument should be maintained in a dry and clean condition and kept in its protective carrying case whenever possible.

WARNING: Extreme care must be taken when cleaning the instrument not to damage the very fragile beta windows.

754/818 17

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D/DAT/13/33/8

AP No 3395 (Pam 4)

ARMY CODE No 3

70273 (Pam 4)

NUCLEAR, BIOLOGICAL AND CHEMICAL DEFENCE TRAINING

PAMPHLET No 4 RADIAC INSTRUMENTS

This pamphlet supersedes Nuclear Training (All Arms) Volume 1 Pamphlet No 2 — Radiac Instruments Lesson Plans (Army Code No 70007/AP3382).

By Command of the Defence Council

Frank Cooper.

MINISTRY OF DEFENCE:

October, 1977

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AMENDMENTS

Amendment Number	By whom amended	Date amended

DISTRIBUTION

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Regular Army	Scale E
TAVR	Scale C
Defence NBC Centre	400 copies
Royal Marines	120 copies

In accordance with AP 113A, Appendix T

Royal Air Force	800 copies

OLD Radiac Survey meter No. 2

c. Slacken the knurled screw on the battery holder (see Figure 25) and remove the existing 30 volt (long thin) battery, if fitted.

d. Insert a new 30 volt battery with its red end (+ terminal) facing towards the top or rubber protected end of the holder. Tighten the knurled screw sufficiently to make a good contact but do not over-tighten as this may distort the holder.

e. Slacken the seat screw on the top or rubber protected end of the holder and remove the existing 9 volt battery, if fitted.

f. Insert the new 9 volt battery with its red end (+ terminal) facing towards the bottom or knurled screw end of the holder. Tighten the set screw sufficiently to ensure good contact but do not over-tighten.

g. Hold the battery holder by the rubber knob and position the complete assembly into the centre of the battery compartment so that the three contacts on the holder connect with the corresponding contacts in the battery compartment.

h. Replace the battery cover and tighten the four fixing screws.

j. Finally carry out the zero check as described in para 88. If the test is still unsatisfactory, try another set of new cells. If the test is still unsatisfactory, the instrument must be considered faulty and exchanged.

k. Suitable batteries are:

(1) Battery Dry 9V No 1
Y3, 6135-99-910-1162.

(2) Battery Dry 30V No 1
Y3, 6135-99-910-1163.

107-109. Reserved.

PDRM75 — Precursor to PDRM82

SECTION 10 — Portable Dose Rate Meter (PDRM)

WARNING

110. The PDRM contains three radioactive sources:

a. 350 microcurie Sr^{90} Y^{90} — beta (user calibration) source.
b. 1.1 curie T^3 — in the two nuclear lamps illuminating the meter scale.

(Whilst the instrument case remains sealed and undamaged, adequate screening is provided; in the event of damage, the instrument should be placed in a closed metal container, and returned for repair through normal channels — if beyond local repair, disposal instructions should be obtained from the appropriate RAOC representative at command or formation level.)

Uses

111. The Portable Dose Rate Meter (PDRM) is used to:

a. measure gamma dose rates, in rad/hour, during:

(1) Radiological (static) monitoring of the arrival, build-up and decay of fall-out.

(2) Radiological reconnaissance (survey), on foot, of areas contaminated with radioactive material (fall-out and neutron induced radioactivity — NIR).

b. provide an indication of the presence of a beta hazard during personnel, vehicle, equipment, stores etc contamination monitoring.

112. The PDRM replaces the Meter, Survey, Radiac No 2 (MSR2) in Army field force units.

Description

113. The PDRM consists of:

a. A carrying case (see Figure 26) comprising:

(1) The case itself with a meter window, internal (instrument) securing strap and cover.

(2) An instruction card which is sewn into the inside of the cover.

(3) A carrying strap, the buckle of which may be used for opening the battery compartment cover.

b. The instrument itself (see Figure 26) comprising:

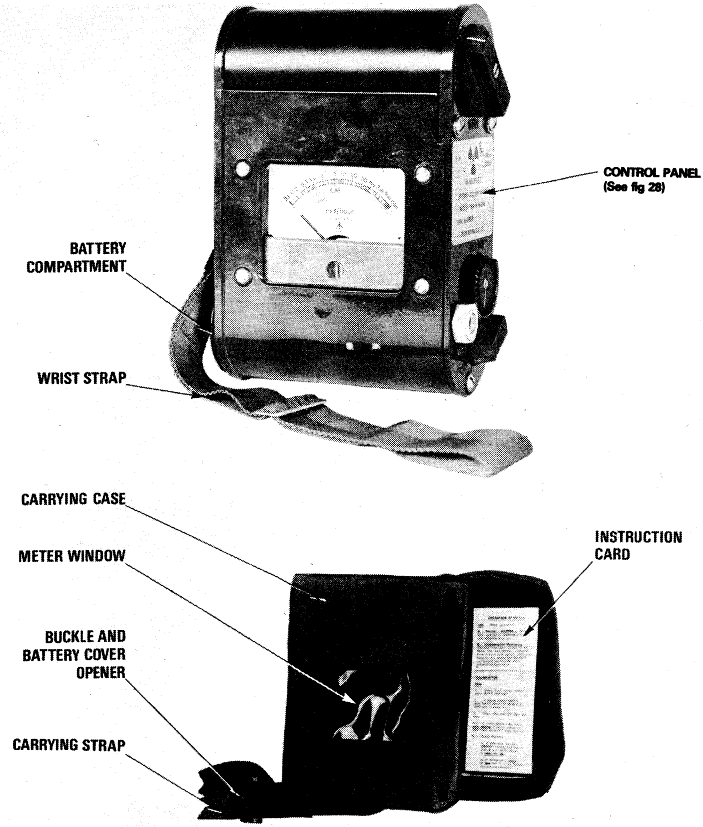


Fig 26 — Portable Dose Rate Meter (PDRM)

(1) A front panel housing an illuminated logarithmic meter scale inscribed from 0.1 to 1000 rad/hour (see Figure 27) in four decades (0.1-1, 1-10, 10-100, 100-1000) with superimposed BATT MIN (battery minimum) and CAL (calibration) marks. (Readings below 0.1 rad/hour — off the left hand side of the scale — are considered to be zero.)

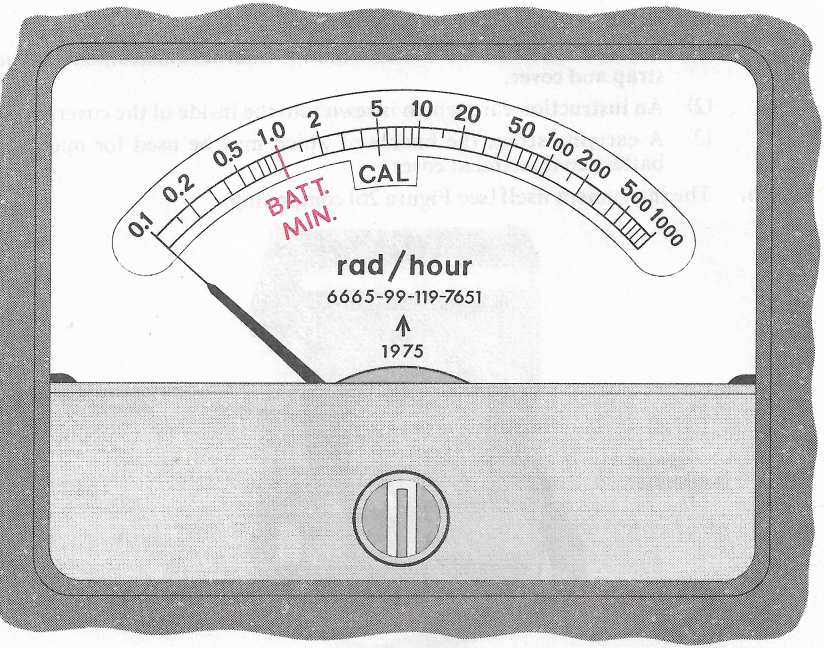


Fig 27 — PDRM meter scale

(2) A control panel, on the right hand side (see Figure 28), with:

(a) A CAL (calibration)/GAMMA/BETA selector (referred to subsequently as the selector).

(b) A date plate which includes a serial number.

(c) A SET CAL adjustment control (referred to subsequently as the control).

(d) A desiccator.

(e) An ON/TEST/OFF switch (referred to subsequently as the switch).

(3) On the left hand side (see Figure 28) there is:

(a) A modification record plate.

(b) An adjustable wrist strap for use during personnel, equipment, etc contamination monitoring.

(c) A battery compartment with (screw-on) cover.

(4) The top of the instrument houses twelve oval beta windows (see Figure D1).

114. The battery compartment houses:

a. A battery B.1 (2.7V) mercury cell (NATO Cat No 6135-99-618-2952), which may be replaced by the operator as detailed in para 120.

b. A battery B.2 (1.35V) mercury cell (NATO Cat No 6135-99-433-5404), which should only be replaced by qualified (REME) workshop personnel.

c. A flying lead with a triangular negative contact.

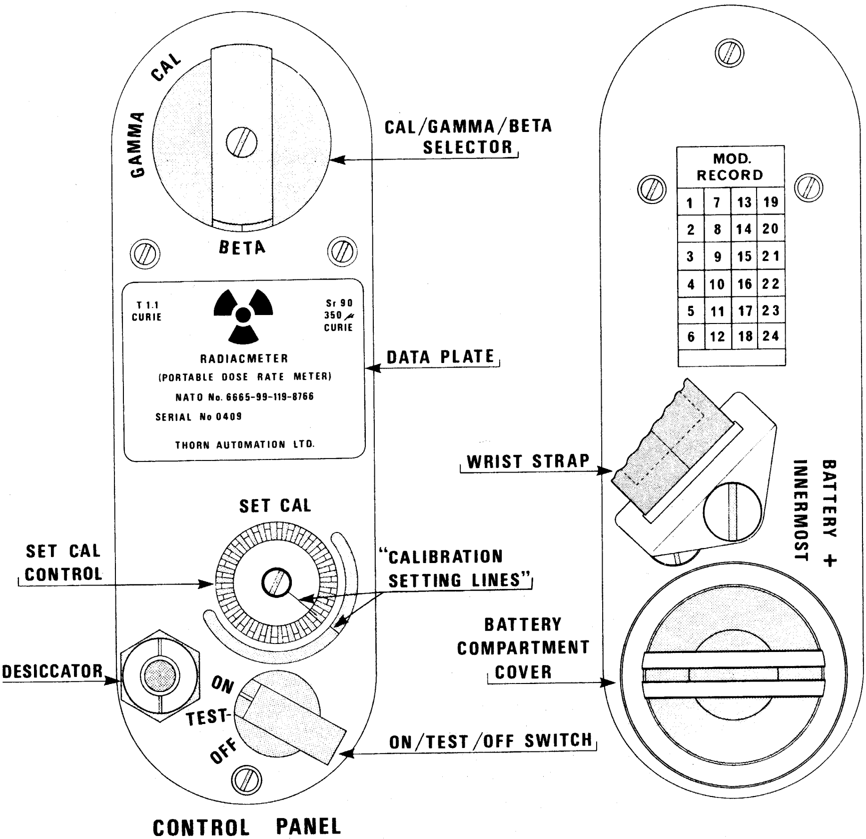


Fig 28 — PDRM side panels

Instrument drills

115. *Preparation for use*

a. Check the PDRM for contamination, dirt, damage and dampness (desiccator pink) (see Annex G), and take action to rectify any faults, or exchange the instrument for a serviceable one.

b. Test the PDRM by turning the switch to TEST, check that the meter needle reads above (to the right of) the BATT MIN mark. If not replace the B.1 battery, as detailed in para 120, and recheck.

c. Check, and if required, adjust the calibration setting of the PDRM, in the following step sequence:

(1) Turn the switch to ON and the selector to CAL. Align the user calibration setting lines on the control with that on its protective cowling. Wait 60 seconds (to allow the instrument to warm up).

(2) (a) If the meter needle is below the 5 rad/hour CAL mark, bring the needle to the CAL mark using the control.

OR

(b) If the meter needle is above the 5 rad/hour CAL mark, note the meter reading.

(3) Turn the selector to GAMMA and note the meter reading.

(4) Compare the readings obtained and noted at (2) and (3):

(a) If the reading at (2) is exactly 5 rad/hour greater than the reading at (3) the PDRM is in correct adjustment and is ready for use. Check that the user calibration setting lines are still aligned. If not, slacken the screw on top of the control, and turn the disc until the line is opposite that on the protective cowling; retighten the screw and repeat steps (2), (3) and (4) as a check.

OR

(b) If the difference is more or less than 5 rad/hour the instrument must be further adjusted using the procedure at steps (5), (6) and (7) below.

(5) Turn the selector back to CAL and using the control if the difference at (4) (b) was:

(a) Less than 5 rad/hour, increase the reading and note it.

(b) More than 5 rad/hour, decrease the reading (but not below the 5 rad/hour CAL mark), and note it.

(6) Turn the selector back to GAMMA, note the new meter reading, and compare it with that set at (5).

(7) Repeat steps (5) and (6) until the reading set at (5) is exactly 5 rad/hour higher than that obtained at (6). The instrument is then ready for use. Check that the user calibration setting lines are still aligned. If not, slacken the screw on top of the control and turn the disc until the line is opposite that on the protective cowling; retighten the screw and repeat steps (2), (3) and (4) as a check.

116. *Emergency calibration.* When the procedure outlined at para 115 c cannot be carried out because the 5 rad/hour difference in reading cannot be obtained or judged accurately (eg where the gamma activity is above 20 rad/hour) or where time

does not permit the full procedure to be carried out, align the user calibration setting line on the control with that on its protective cowling. In this situation, the instrument has not been calibrated against the internal radioactive source. Confidence in the instrument can be increased by comparing the readings with another instrument. However, measurements taken after emergency calibration should always be treated with caution.

117. *Radiological monitoring and reconnaissance (gamma measuring) roles*

a. Prepare the PDRM for use as described in para 115 (or para 116 in an emergency).

b. Turn the switch to ON and the selector to GAMMA.

c. Hold the instrument in its carrying case, approximately one metre above the ground (with the carrying strap over the shoulder or around the neck) and the meter dial facing upwards.

d. Read the gamma dose rate in rad/hour and report and/or record it as required by your orders.

118. *Contamination monitoring (beta indication) role*

a. Prepare the PDRM for use as described in para 115 (or para 116 in an emergency).

b. Determine the gamma radioactivity, as described in para 117 and note the reading.

c. Remove instrument from its carrying case and put the wrist strap onto your wrist.

d. Turn the selector to BETA.

e. Frisk the person, equipment, vehicle, store, ground etc holding the instrument 2-3 cm from, and with the beta windows facing, the surface of the item to be monitored. Any reading above that obtained at b indicates the presence of beta contamination. (A militarily significant beta contamination hazard exists when the beta indication (combined gamma and beta reading) is double the gamma reading, or if any reading is obtained when there was no gamma reading.)

Care and maintenance

119. Care and maintenance, including the methods for chemical and nuclear decontamination are contained in the user handbook (UHB) (Army Code No 61503).

120. Battery changing (see Figure 29) when the TEST reading is found to be below the BATT MIN mark.

a. Remove the instrument from its carrying case.

b. Turn the switch to OFF.

c. Open the battery compartment cover by turning it anti-clockwise. (A small coin or the carrying strap buckle may be used.)

d. Hold the triangular negative contact clear, and tip the battery out of its compartment.

e. Insert a new B.1 battery ensuring the positive end (marked +) goes in first.

f. Replace the triangular negative contact centrally onto the base of the new battery.

g. Screw in the battery compartment cover clockwise ensuring the centre nipple of the cover is within the triangle of the negative contact and the three points of the triangle are in contact with the battery.

h. Retest as described in para 115b.

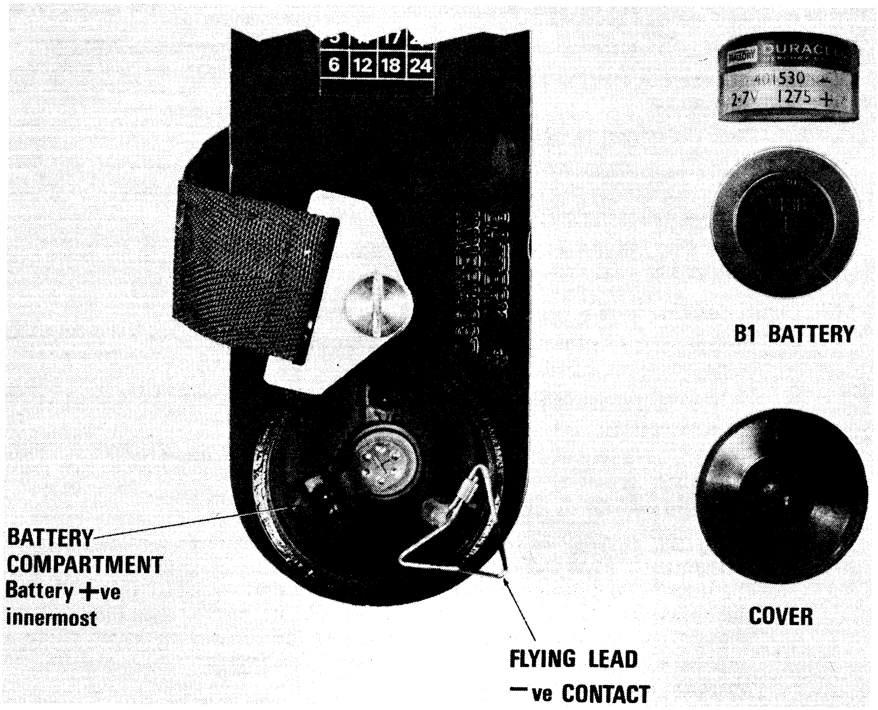


Fig 29 — PDRM battery compartment and components

Mercury batteries

121. **a.** *General.* The mercury batteries used in the radiac meter are capable of generating toxic gases at high pressure and may burst if they are subject to any one of the following:

(1) Excessive heat.

(2) Prolonged short circuit.

(3) Discharge well beyond their operating life.

Additionally, mercury batteries could constitute an environmental health hazard if incorrectly disposed of.

b. *Disposal.* Unserviceable mercury batteries will be backloaded through RAOC channels for subsequent delivery to an authorized recycling plant. Under no circumstances will mercury batteries be disposed of under local arrangements, eg by burying etc. Every precaution must be taken against

QUARTZ FIBRE PEN DOSIMETER

≡ CAPACITOR

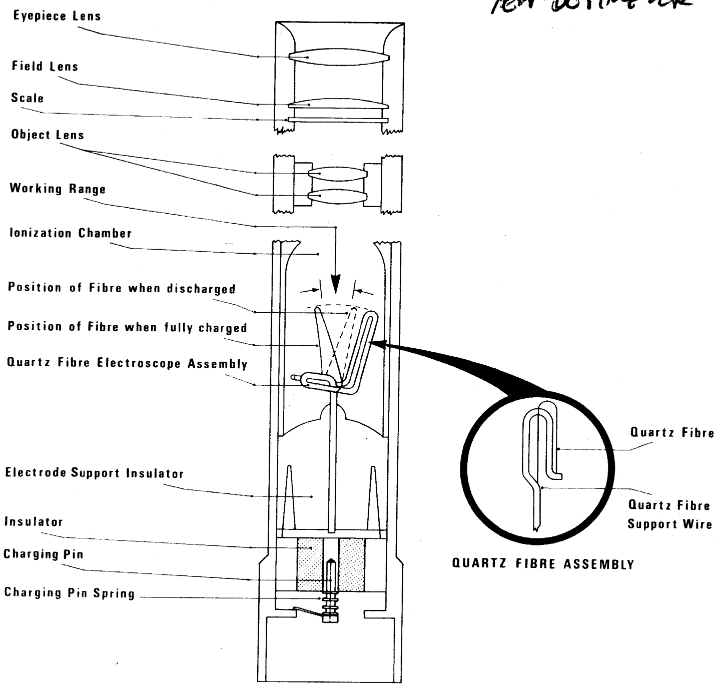


Fig A1 — QF dosimeter construction

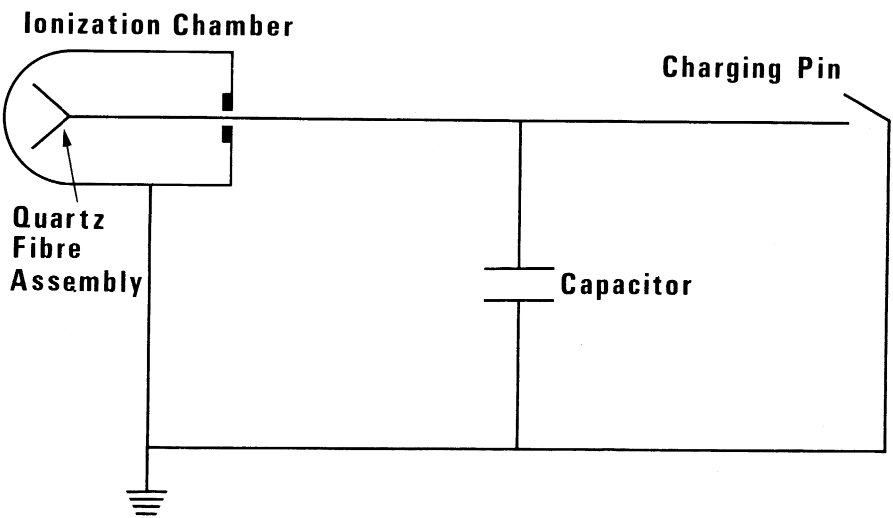


Fig A2 — Simplified circuit diagram

ANNEX D — PORTABLE DOSE RATE METER (PDRM) WORKING PRINCIPLES

NOTE. This annex is written to provide additional background information for instructors, and should be read in conjunction with Section 10.

1. The Portable Dose Rate Meter (PDRM) employs an ionization chamber, filled with nitrogen under pressure, to detect and quantify the intensity of nuclear radiation present. The effect of nuclear radiations penetrating into the sealed ionization chamber is to convert the nitrogen from a very good into a poor insulator (see Note) which permits a current to flow from the central to the outer electrodes. The rate of flow is proportional to the radiation dose rate present and, after amplification, is displayed as a reading on the meter scale.

2. The ionization chamber is housed in a rotatable cylinder which is connected to the CAL/GAMMA/BETA selector (see Figure D1).

a. In the normal GAMMA position only gamma rays (shown in red) can penetrate into the chamber.

b. When the selector is set to CAL, a thinner part of the wall of the chamber is exposed to the 350 μCi beta source (Sr^{90} Y^{90}) which allow beta particles (shown in green) to enter the ionization chamber and simulate the 5 rad/hour gamma dose rate required by the user to calibrate the instrument. *

c. When the selector is set to BETA, a thinner part of the wall of the chamber is exposed to the beta windows in the outer case of the instrument, thereby permitting beta particles (shown in green) from the contaminated area as well as the gamma rays (shown in red) to penetrate into the ionization chamber which gives an indication of the beta contamination hazard present. (The reading obtained is a combined gamma and beta one.)

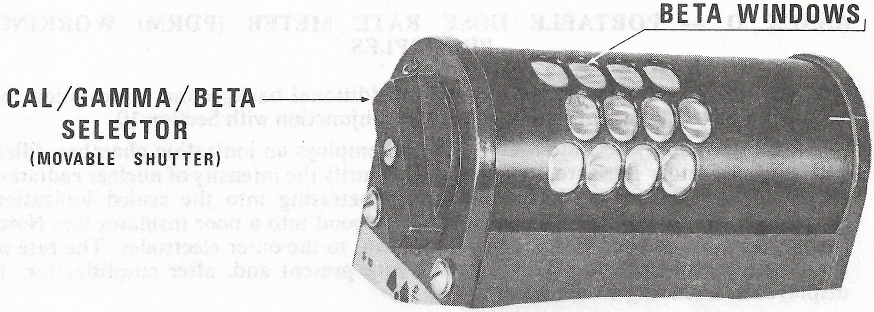
3. Further details are contained in:

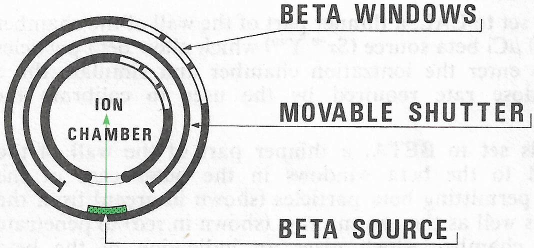
a. UHB (Army Code No 61503).

b. EMER Telecommunications V292.

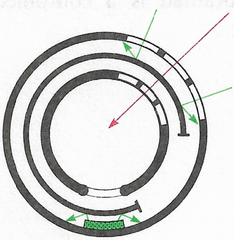
NOTE. This process is called ionization.

BUT REMEMBER :-
THE Y/SR-90 CALIBRATION SOURCE
HAS A HALF-LIFE OF
28·8 YEARS, SO IT
LOSES 2.4 % PER YEAR,
OR 21.4 % PER DECADE!

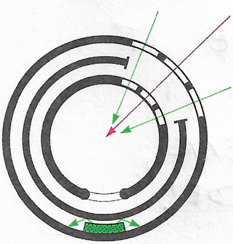




SELECTOR AT 'CAL'
(ION CHAMBER EXPOSED TO BETA SOURCE)



SELECTOR AT 'GAMMA'
(BETA SOURCE AND WINDOWS 'SHUTTERED' OUT)



SELECTOR AT 'BETA'
(ION CHAMBER WITH BETA WINDOWS)

BETA →   GAMMA →

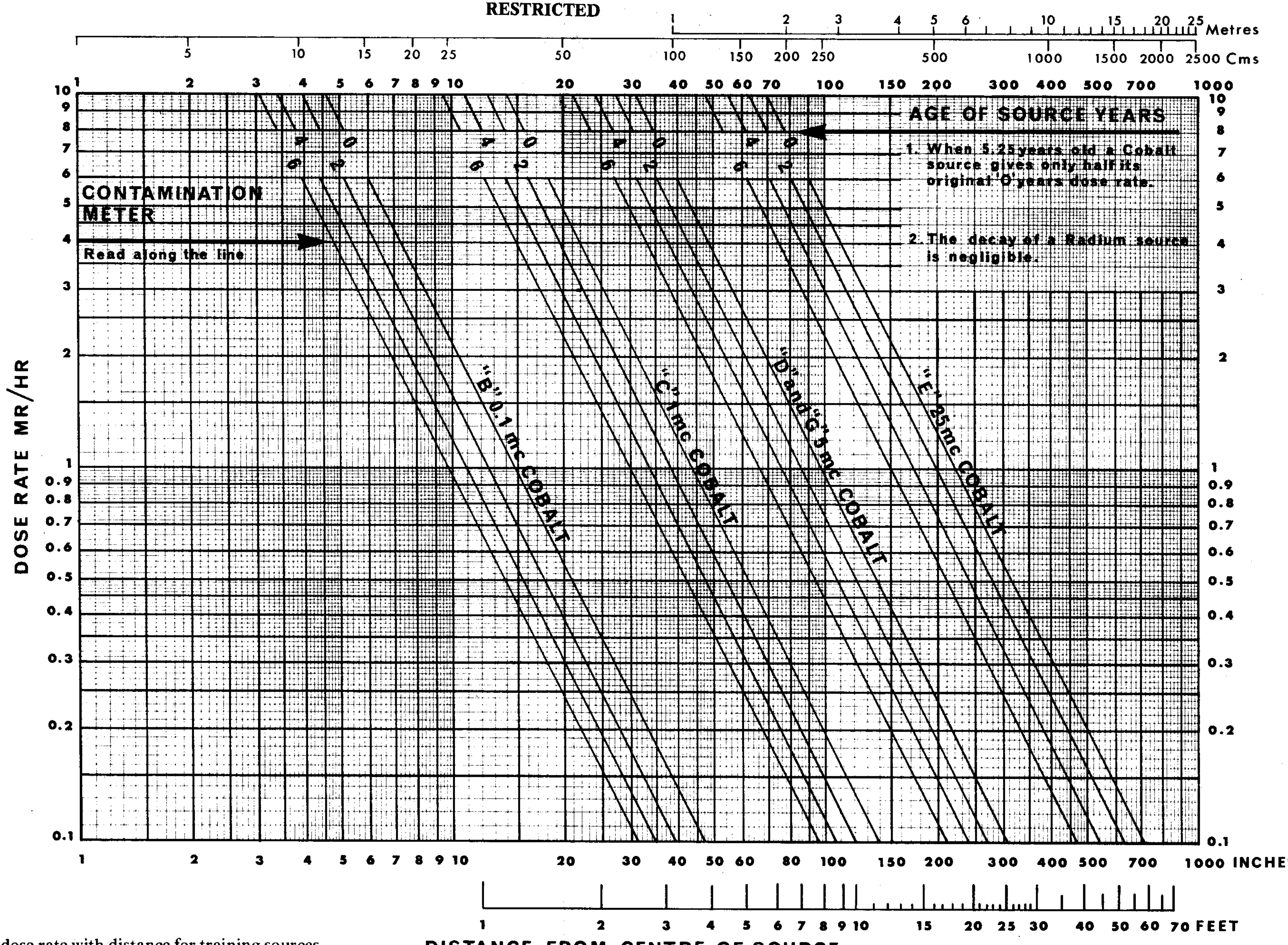


Fig E1 — Variation of dose rate with distance for training sources

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MOD (Air) No. 3395 (Pam 8)

ARMY CODE NO.

70273 (Pam 8)

NUCLEAR, BIOLOGICAL AND CHEMICAL DEFENCE TRAINING

PAMPHLET No. 8
TRAINING AND TRAINING EQUIPMENT

This pamphlet supersedes " Gas Training 1951 " Section 10 and Appendices B and C (WO Code No. 8511, AP 3221A); " The Gas Officers Handbook 1951 Sections 10 to 14 and Appendix A (WO Code No. 8630); " Nuclear Training All Arms " Volume 1 Pamphlet No. 1—" Precautions Against Nuclear Attack ", Chapter 5 (WO Code No. 9466); " Nuclear Training " (All Arms) Volume 1, Pamphlet No. 2—" Radiac Instruments Lesson Plans " (Army Code No. 70007) Part 3 and Supplement No. 1.

By Command of the Defence Council

J T Durrett

MINISTRY OF DEFENCE,

November, 1971

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AMENDMENTS

Amendment Number	By whom amended	Date amended

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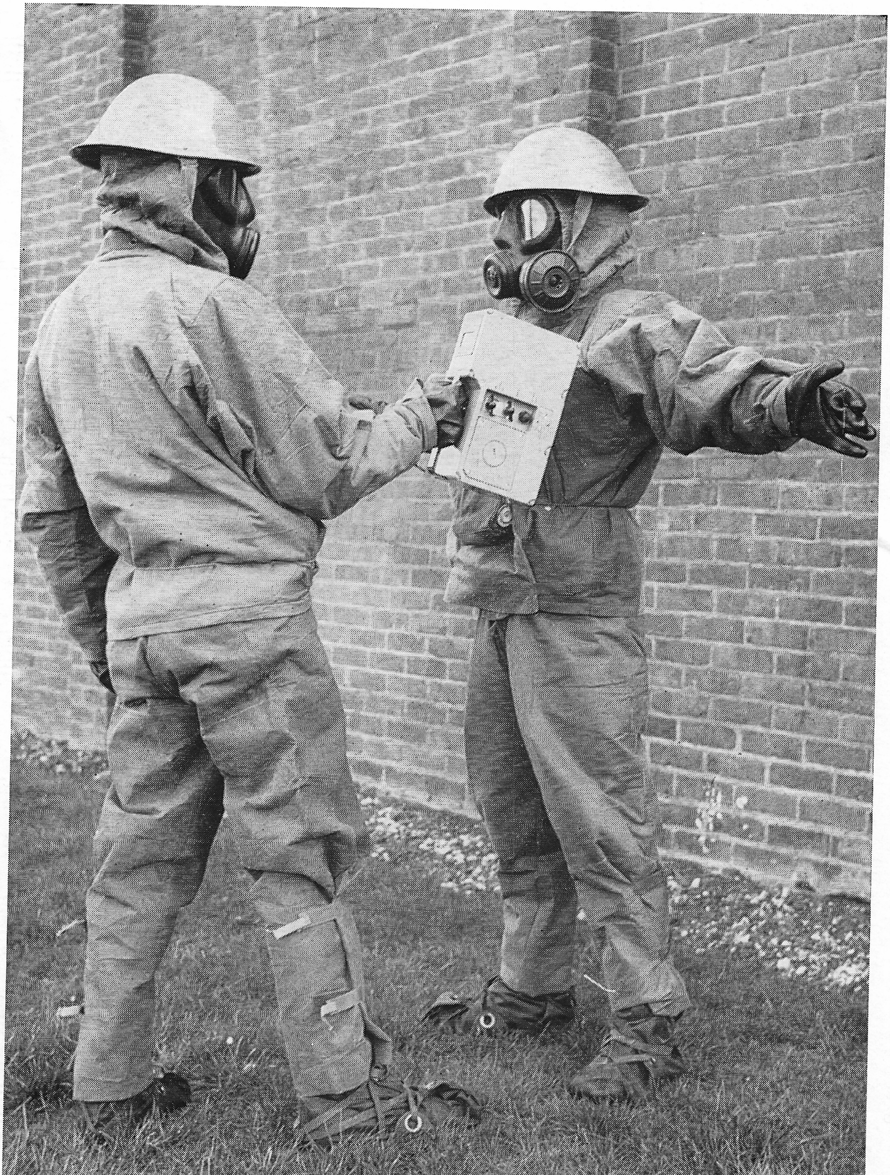

Fig. 25.—Monitoring personnel

Sealed radio-active training sources

277. The radio-active substance used for training sources is Cobalt 60 and four types of source are issued:

Serial No.	N.A.T.O. stock number	Type of source	Nominal activity	Ident colour on carrying rod	Transport index	NSN of container	Approx. weight of container and source
(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	(*g*)	(*h*)
1.	6665–99–911–0016	B	00·1 millicuries	None	1·5 (10 sources) 0·75 (5 sources)	6665–99–911–0021	4 kilos (9 lbs.)
2.	6665–99–911–0017	C	1·0 millicuries	Blue	0·75	6665–99–911–0022	5 kilos (11 lbs.)
3.	6665–99–911–0018	D	5·0 millicuries	Brown	1·25	6665–99–911–0023	10 kilos (22 lbs.)
4.	6665–99–911–0019	E*	25·0 millicuries	Black	1·5	6665–99–911–0024	33 kilos (72 lbs.)

* Available on special request.

278. The transport index is defined as the maximum radiation dose-rate in mr/hr at one metre from the centre of the container. It is used in connection with the transportation of sources, (*see* para 331 c.).

Containers

279. Care must be taken to ensure that sources are stored and carried in their correct containers. Sources are always to be kept in their containers when not being used for training.

280. Each container has the type and serial number of the source it contains stencilled on the outside. Serial numbers and the type are also stamped on each source in RED and each source must be related to its correct container. A plate on the lid of the container gives the container and serial number. When Cobalt 60 sources are reactivated the date of reactivation will be found stencilled on the container and on a gummed label inside the lid. The metal plate on the lid gives the date of manufacture of new sources.

281. The current sign denoting radio-activity is the trefoil (*see* Fig 31) but many containers at present in service have other markings. All containers are normally coloured orange (BS 381 C No. 557) or yellow (BS 381 C No. 309).

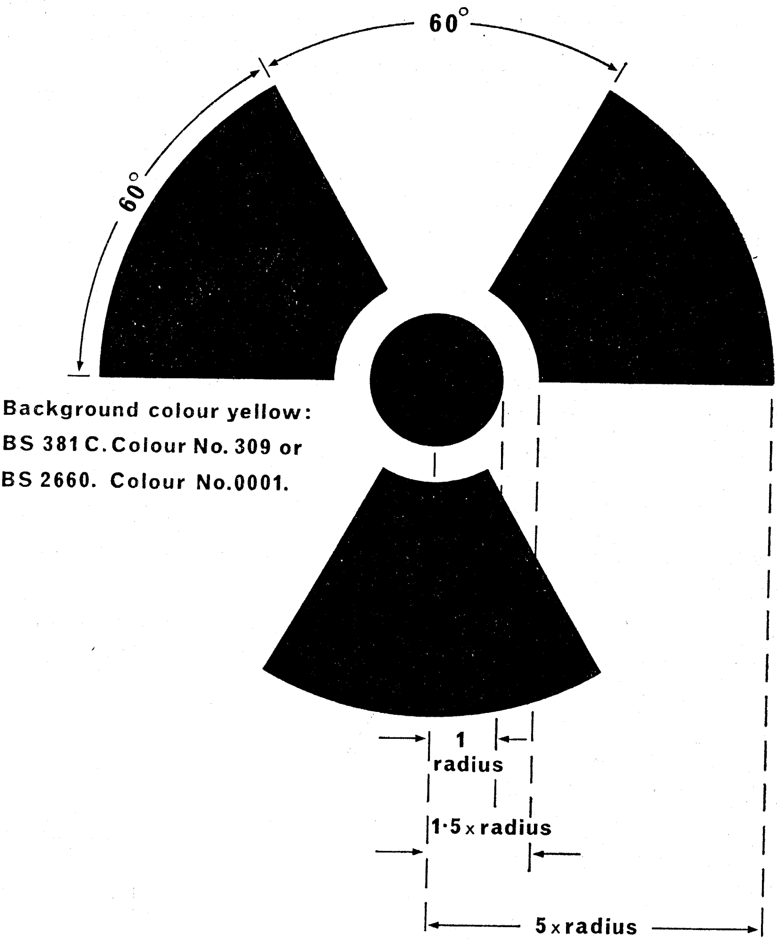

Fig. 31.—The trefoil sign

Training sources

282. *Type B* (*see* Fig 32). These are small button-like sources 0·1 millicurie in strength giving a dose-rate of approximately 0·13 mr/hr at a distance of about one metre. They are intended to simulate radio-active dust on clothing, equipment, etc. They are also used for calibration of the Meter Doserate Portable Trainer (*see* SECTION 31). INDIVIDUALS CAN HANDLE AND CARRY SINGLE Type B sources in training without significant risk but the source **should not be held or carried for longer than 20 minutes.** In store they are kept in a metal cylinder screwed to a carrying rod. The cylinder holds five or ten Type B sources. When all ten sources are together in one

cylinder they are equal to one Type C source and must NOT BE HANDLED without the aid of tongs. The following precautions are to be observed when removing Type B sources from the metal carrying cylinder:

a. Pick up the carrying rod by the end farthest from the cylinder containing the sources.

b. Hold the cylinder with a pair of long handled tongs.

c. Unscrew the carrying rod.

d. Tip out the sources on to a table.

e. Pick up individual sources from the pile with a pair of forceps or tweezers.

f. Once clear of the pile the source may be handled.

283. In returning the sources this procedure is reversed; the sources must be returned to the cylinder with a pair of forceps or tweezers and NOT with the bare fingers.

284. Because of their size "B" sources may be more easily lost than other sources. It is essential that after each training session the sources returned to each container are counted to ensure that there are none missing. A lost "B" source or one left in an individual's pocket could give rise to a serious health hazard.

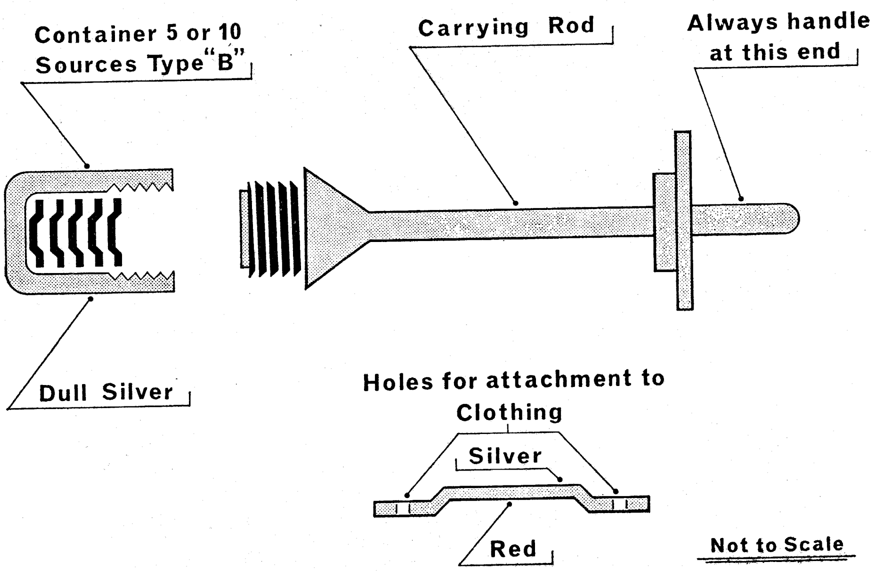

Fig. 32.—Radio-active source, Type B

285. *Type C* (*see* Fig. 33). These are one millicurie in strength and give a dose-rate of approximately 1·3 mr/hr at a distance of approximately one metre. The carrying rod is in one piece and has a plain end coloured BLUE. "C" sources are used for demonstrations, lectures and indoor and outdoor exercises.

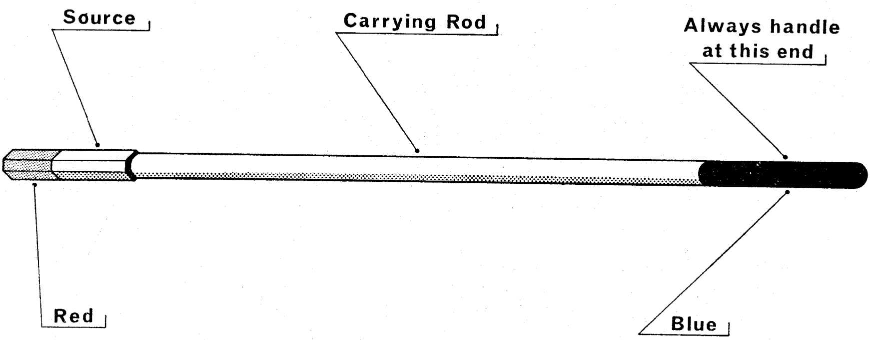

Fig. 33 —Radio-active source, Type C

286. *Type D* (*see* Fig. 34). These are five millicuries in strength and give a dose-rate of approximately 6·5 mr/hr at a distance of approximately one metre. The carrying rod is in two pieces which must be screwed together to ensure that, when carried, the source is at a safe distance from the hand. The end farthest from the source is fitted with a button-shaped head and coloured BROWN. The source is intended to be used for outdoor exercises and demonstrations.

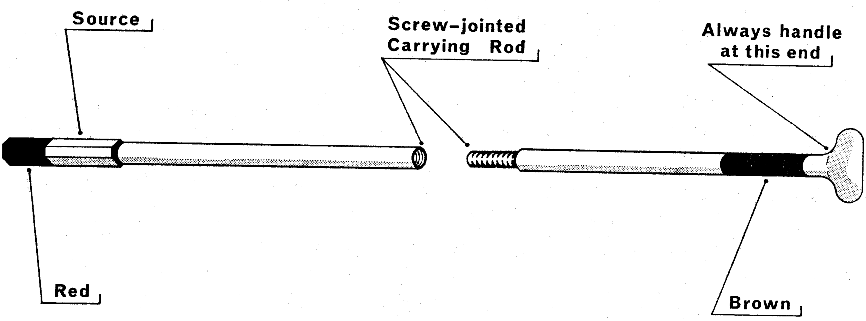

Fig. 34.—Radio-active source, Type D

287. *Type E* (*see* Fig. 35). These are 25 millicurie in strength and give a dose-rate of approximately 33 mr/hr at a distance of about one metre. The carrying rod is in two pieces which must be screwed together to ensure that the source is carried at a safe distance from the hand. The end farthest from the source is coloured BLACK. The source is for use in large scale

training exercises or for special trials purposes. Because of their strength "E" sources are not included in Radiac Training Sets and are available only on special authority which may be obtained through commands.

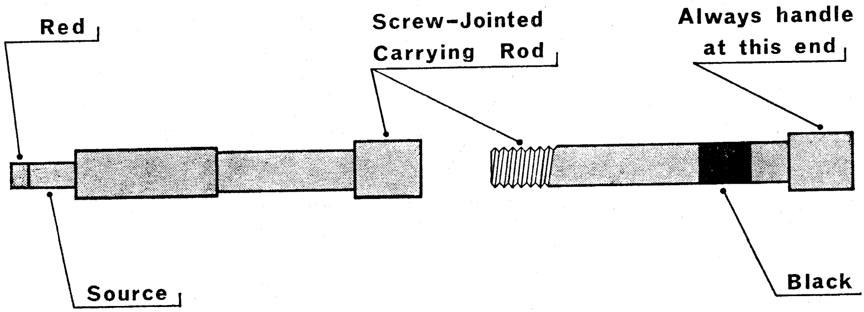

Fig. 35.—Radio-active source, Type E

288. All types of source may be used for calibration checks of the Meter Contamination No. 1 or No. 1 Mk 2 (*see* Nuclear Training (All Arms) Vol 1. Pamphlet No. 2 "Radiac Instruments Lesson Plans". Part 5 SECTION 4 (Army Code No. 70007) (Part 5). To be replaced by NBCDT Pamphlet No. 4. A series of exercises involving the use of these sources are described in SECTION 46.

Paras 289–297 *Reserved.*

SECTION 32—**Unit responsibilities**

The commanding officer

298. The commanding officer will take the following action when any of the radio-active sources listed in para. 277 are to be stored, used or transported under unit arrangements:

a. Ensure that the following instruments, which are part of the Radiac Training Set, are available:

(1) Dosimeter QF No. 1 or No. 1 Mk 2 or No. 7.

(2) Charging Unit No. 1 or No. 2 Mk 2 or No. 3.

(3) Meter Contamination No. 1 or No. 1 Mk 2.

(4) Meter, Dose-rate, Portable, Trainer, No. 1.

b. Ensure that the unit *Medical Officer* (MO) is informed in advance of the first acceptance of sources and of their intended use. The MO must also be informed of any changes in the use of sources already held. The MO is generally responsible for all medical matters concerning personnel working with radio-active sources. Special medical instructions are at Annex L.

HEADQUARTERS
UNITED KINGDOM LAND FORCES

OPERATIONAL & TACTICAL NOTES FOR HOME DEFENCE

G3/G4 UK 2241

UNITED KINGDOM LAND FORCES

OPERATIONAL AND TACTICAL NOTES

FOR

HOME DEFENCE

FOREWORD

1. We now have a clear Concept of Operations for Home Defence and must concentrate on disseminating it to those who may have to carry out such operations.

2. This UKLF pamphlet is a RESTRICTED level document which provides the information needed by commanders at sub-unit level. It also provides information on how operations might develop within the United Kingdom in Transition to War, and War, for use as a basis for Home Defence training. It should be widely distributed and read by all Home Defence Commanders down to company/squadron level.

JBAkehurst

J B AKEHURST
Lieutenant General
Commander UK Field Army

18 May 84

G3/G4 (UK) 2241

SECTION 66 - ELECTROMAGNETIC PULSE (EMP)

6601. EMP is a burst of energy, released in the form of a pulse of electromagnetic radiation in all nuclear explosions, air bursts being the most damaging. It induces very high voltages and currents in cables, telephone lines, antennae and similar conductors, which in turn damage individual components in the associated equipments. Transistors are particularly vulnerable.

6602. Protective measures which should be taken:

a. The disconnection of antennae, co-axial cables, remote control cables, power leads and line cables to equipment not in use.

b. Switch off the equipment.

c. Earth input and output terminals.

d. Connect metal casings to earth.

e. Wrap equipment in metal foil if possible.

6603. Some vital equipments will be required to remain switched on. These terminal equipments will normally incorporate "EMP hardening" in their design. This provides limited protection from this aspect of nuclear explosions. EMP hardened equipments include CLANSMAN and MOULD radios. It must be presumed that all other equipment in use in HD communication (exchanges, teleprinters etc) are not EMP protected.

SECTION 86 - PUBLIC INFORMATION

8601. It is important to recognise the particular importance of the media to the successful conduct of operations in the United Kingdom.

8602. Public opinion is extremely volatile and increasingly responsive to the influence of the news media, particularly television. It is generally accepted that military operations - particularly in the home base - cannot be successful without majority public support. Therefore it follows that commanders at all levels should be aware of their responsibilities in the field of media relations.

8603. They should appreciate that even trivial incidents involving the press or television can escalate at an astonishing rate into issues of national concern attracting wide public interest and Ministerial and Parliamentary scrutiny. A study of the Army and the Press in Northern Ireland will indicate the complexities and ramifications involved when the Army acts in full view of the home-based media. Television techniques of increasing sophistication will focus public attention more forcefully and rapidly on all events of "news value". In operations at home it may no longer be enough for the Army to do its duty - it will have to be <u>seen</u> to be doing its duty. Otherwise the consequences as regards public opinion and through it possibly even the outcome of any operation may be extremely serious.

8604. Therefore it is important that commanders should develop a good appreciation of the likely effect of their actions on the media and hence the public. They should be aware of the necessity for accurate and timely reporting through correct PR channels of any incident which may attract media interest. They should also be aware of the subtleties of handling any media representatives with whom they come into contact, and that even a very junior journalist from a small newspaper has the capacity to feed a story into Fleet Street and bring about the full glare of national publicity. It all depends on the incident and its interpretation. It is always a good plan to have a relatively senior officer earmarked for press liaison duties and again a study of the unit press officer system and in particular its application in Northern Ireland will be profitable.

8605. Many eminent authorities have stressed that wars can only be won if the public broadly support them. The key to public opinion is the media. The importance of the media and the Army's relationship with it in any future conflict - particularly in the home base - cannot be over emphasised.

ARMY CODE NO.
9637 (part 1)
(Revised 1964)

A/26/G.S. Trg. Publications/2750

THE LAND BATTLE

PART 1

TACTICS, NUCLEAR OPERATIONS IN EUROPE

(*Prepared under the direction of the Director of Army Training*)

This pamphlet supersedes The Land Battle Part 1—Tactics, 1960 (Code No. 9637), The Corps Tactical Battle in Nuclear War, 1958 (Code No. 9564) and Sequel No. 1, 1959 thereto.

By Command of the Defence Council.

MINISTRY OF DEFENCE,

3rd September 1964

CHAPTER V

THE NUCLEAR BATTLE

SECTION 11—THE HANDLING OF GROUND FORCES

Tactics in the attack

157. In the attack the commander must :—

(a) locate and destroy or neutralize as many of the enemy's nuclear delivery systems as possible ;

(b) maintain the speed and momentum of his attack ;

(c) destroy those enemy forces that block the direction of his advance ;

(d) avoid the presentation of nuclear targets to the enemy.

(evacuate targets or protect them)

158. Suitable forces for these tasks will be highly mobile both by day and by night, capable of fast movement across going of all types, and with the highest possible protection against nuclear attack while on the move. There is likely to be a preponderance of tanks, APCs and armoured reconnaissance vehicles in any attacking force operating under nuclear conditions. These forces are likely to be used in conjunction with airborne formations.

159. The tactical handling of armoured forces of this kind in the attack will aim :—

(a) to exploit the effects of nuclear strikes ;

(b) to overwhelm the enemy defences with the weight and speed of the attack ;

(c) to maintain a constant pressure on a withdrawing enemy so that his nuclear fire power cannot be brought to bear on the attacker without danger to the withdrawing forces ;

(d) to by-pass enemy units where necessary in order to maintain the speed of the advance.

160. High priority targets for the attacker's nuclear weapons are likely to be :—

(a) enemy nuclear delivery systems ;

(b) engineer units, particularly those employed on the preparation of obstacles ;

(c) formation HQ and communication systems ;

(d) reserve formations, particularly armoured units.

161. In addition to nuclear weapons, there is no reason to doubt that an attacker will resort to chemical warfare to achieve his aims.

162. The greatest difficulties that are likely to face an attacker are :—

(*a*) to concentrate armoured forces in order to exploit nuclear strikes, without presenting a suitable target to enemy nuclear weapons ; (⟹ NEUTRON BOMB W79)

(*b*) to neutralize enemy means of surveillance ;

(*c*) to acquire targets for nuclear strikes ;

(*d*) to re-supply his forces.

Conduct of the defence

163. In defence, against a numerically superior enemy, the commander must :—

(*a*) disrupt enemy attacking formations before they make contact with the main defensive forces ;

(*b*) control ground of his own choosing :—

(i) to make the attacker present nuclear targets ;

(ii) to preserve the necessary means of combat surveillance and nuclear weapon delivery ;

(*c*) deliver nuclear weapons quickly and accurately.

164. The execution of these tasks requires a defensive system which will form the basis of the defender's tactical plan. Each part of this is studied in greater detail in subsequent sections of this chapter. The defensive system will take account of the following factors :—

(*a*) The destructive power of the nuclear weapon coupled with modern methods of combat surveillance invalidates a fixed defensive line. (UNLESS NEUTRON BOMBS STOP/DETER CROSSING OF THE LINE!!)

(*b*) The system of defence must :—

(i) force the enemy to reduce the speed of his advance ;

(ii) canalize the direction of his advance ;

(iii) induce his follow-up forces to concertina against the leading troops.

(The obstacle zone, which provides a system of this sort, is discussed in greater detail in Section 13.)

(*c*) The deployment of covering forces will be necessary to ensure the disruption of the attacking forces and to win time. The tactics suitable to covering forces are discussed in Section 14.

(*d*) Until contact is made with the enemy forces, information must be obtained of the speed, direction and strength of the enemy's leading elements. This requires a screen ; the composition and tasks of screen forces are discussed in Section 15.

(*e*) The part played by air forces in the nuclear battle which is discussed in Section 16. It does not differ greatly from non-nuclear operations.

(*f*) Air defence, which is covered in Section 17.

Section 21—PROTECTION OF MEN AND EQUIPMENT AGAINST NUCLEAR ATTACK

Policy

296. In nuclear war, men and equipment must be protected from the primary and secondary effects of nuclear attacks but protective requirements must take second place to operational effectiveness whenever the two conflict.

Protective measures SEE P. 57 (APPENDIX A) FOR TABLES!

297. The effects of nuclear weapons have been summarized in Chapter I. They, and the protective measures against them, are described in detail in "The Nuclear Handbook for Instructors and Staff Officers, 1963" (Code No. 9405) and "Nuclear Training All Arms, Volume I, Pamphlet No. 1—Precautions against Nuclear Attack" (Code No. 9466).

298. Nuclear defensive measures must be laid down in SOPs of all formations and units and any special measures necessary for a particular operation must be included in the operation instructions concerned.

Exposure control

299. After operating in areas contaminated by radio-active fall-out, units should check the degree of contamination to which they have been subjected. It is a command responsibility to decide the future employment and location of contaminated troops and the highest radiation dose level to which they can be further exposed without risk of severe casualties. Decontamination drills will be carried out at the earliest opportunity.

Battle shelters

300. The priorities in the construction of battle shelters are as follows :—

(*a*) Work should be carried out under a screen affording some camouflage and thermal protection.

(*b*) Trenches should be narrow and deep with vertical sides. 4 feet 6 inches is the optimum depth.

(*c*) The temporary thermal shield should be replaced by proper overhead protection.

(*d*) Shelters should be enlarged progressively to allow men to carry out the functions of life and operational tasks effectively.

301. Digging must be a standard drill and not an emergency measure. A properly constructed trench will provide excellent protection.

302-306. *Reserved.*

Sign posting of contaminated areas

314. Units and formations will be responsible for sign posting contaminated areas within their own occupied areas. Provost carry out any sign posting in areas evacuated or unoccupied by units, particularly on main supply routes. Details of marking are given in " Staff Duties in the Field " (Code No. 8457), Chapter 3, Section 9.

315-319. *Reserved.*

SECTION 23—CHEMICAL AND BIOLOGICAL WARFARE

Geneva Protocol

320. The Geneva Protocol of 1925, banning chemical and biological warfare was ratified by the United Kingdom and many other countries. The United Kingdom will not, therefore, initiate the use of toxic chemical agents in war.

321. This section is concerned with defence against chemical and biological agents which might be employed by an enemy in conjunction with nuclear weapons.

Chemical warfare

322. A CW agent is any substance which will kill or incapacitate an enemy by its poisonous, blistering or irritating effects.

323. Chemical agents are classified according to their effects :—

(*a*) Nerve Agents—which attack the nervous system resulting in rapid disability and death. They are effective even in small doses.

(*b*) Blister Agents—which cause blisters on the skin and damage to the eyes and lungs, but do not cause death except in extreme cases. Blisters do not appear for some eight hours after exposure.

(*c*) Choking, Tear, Nose, Blood, Paralysing and Psycho-chemical Agents—these mainly cause casualties without permanent injury.

324. Most agents may be disseminated in any of the following forms :—

(*a*) Liquid droplets or spray, like rain.

(*b*) Liquid aerosols, like a fine mist, small enough to be inhaled.

(*c*) Vapour, like a gas.

(*d*) Very small particles of solids, like smoke.

APPENDIX A

NUCLEAR WEAPONS PLANNING GUIDE

Note : These tables are provided only as a guide ; they are based on " Artillery Training, Vol VIII, Pamphlets 1 and 2 ". However, various simplifications have been made to present the data concisely.

PART I—Family of Delivery Systems and Associated Weapons

	Range (Kms)		Associated Yield(s) (KT)									Burst Capabilities				Horizontal Delivery Errors (metres) (*a*)		
	Min	Max	0·5	1	2	5	10	20	50	100	200	High Air	Low-Air	Sur-face	Sub-Sur-face	Mini-mum Range	Medi-um Range	Maxi-mum Range
(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	(*g*)	(*h*)	(*j*)	(*k*)	(*l*)	(*m*)	(*n*)	(*o*)	(*p*)	(*q*)	(*r*)	(*s*)	(*t*)
Medium Range Gun . .	2	20		✓	✓							✓	✓			30	135	270
Long Range Gun . .	3	30			✓		✓					✓	✓			45	230	405
Small Free Rkt . .	3	25	✓	✓	✓		✓					✓	✓	✓		85	380	675
Large Free Rkt . .	7	40				✓		✓	✓			✓	✓	✓		190	595	1080
Medium Guided Missile	50	150				✓		✓	✓			✓	✓	✓		915	915	915
Heavy Guided Missile	50	300	In high KT and MT Range									✓	✓	✓		1830	1830	1830
Fighter ac		800(*b*)				✓	✓	✓	✓	✓	✓	✓	✓	✓		460	460	460
ADM	—	(*c*)	✓	✓		✓	✓		✓	✓				✓	✓			

Notes : (*a*) The radius around DGZ within which 90% of weapons can be excepted to explode.
(*b*) Radius of action.
(*c*) Can be fired by remote control.

APPENDIX A—*continued*

PART II—Casualty/Damage radii and Troop Safety distances for Low Airburst (*a*) (*b*) (*g*)
(Distances from GZ, in metres)

Yield (KT)	Exposed tps		Protected tps		Wheeled Vehs	Tanks and Arty	Tree blow-down Type II Forest	Induced radi-ation (*c*)	2nd degree burns on EXPOSED skin	Radius of Safety (*d*) (*g*)					
										Warned Exposed			Warned Protected		
	Prompt	Delayed	Prompt	Delayed						Neg	Mod	Emer	Neg	Mod	Emer
(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	(*g*)	(*h*)	(*j*)	(*k*)	(*l*)	(*m*)	(*n*)	(*o*)	(*p*)	(*q*)
0·5 (*e*)	425	675	300	500	125	100	300	—(*f*)	325	1475	1200	950	1200	975	750
1	550	775	400	600	250	150	400	300	725	1675	1400	1200	1350	1200	950
2	625	875	450	675	350	200	500	350	1050	1750	1500	1300	1450	1200	950
5	800	1050	625	825	500	300	800	450	1550	2025	1700	1375	1625	1350	1100
10	875	1175	700	900	650	375	1000	500	2075	2600	1825	1525	1750	1500	1200
20	1125	1250	800	1000	875	500	1300	600	2675	3325	2225	1775	1850	1600	1325
50	1625	1625	1050	1175	1250	725	2100	700	3550	4875	3100	2500	2475	1825	1500
100	2125	2125	1025	1275	1650	950	2600	800	4950	6375	4125	3250	3125	2300	1650
200	2800	2800	1100	1425	2175	1275	3200	850	6300	8300	5500	4325	3900	2900	1700

(*a*) A low airburst precludes fall-out. This table is constructed to show the effects of weapons detonated at an IDEAL height of burst.
(*b*) The greatest likelihood of achieving an IDEAL height of burst occurs at the shortest ranges, where fuzing errors are smallest. Fuzing errors increase as the range increases. This fact, combined with the necessity to avoid fall-out, results in heights of burst being raised above the IDEAL at the greater ranges. The radii of damage to be expected will, therefore, be significantly smaller than those shown above.
(*c*) 2 rad/hr radius at 1 hr after burst (Type II soil).
(*d*) A buffer distance which allows for horizontal delivery errors must be added to these radii of safety. Normally the size of the buffer distance will be about the same as shown in columns (*r*)–(*t*) in PART I.
(*e*) Surface burst data.
(*f*) Fall-out governs.
(*g*) Safety figures apply to the offensive use only. Vulnerability of our troops to enemy attack must be deduced from the tables in the " Nuclear Handbook for Instructors and Staff Officers, 1963 " (WO Code No. 9405).

26/GS Trg Publications/2894

AP No.
3395 (Pam 5)

ARMY CODE No.
70273 (Pam 5)

NUCLEAR, BIOLOGICAL AND CHEMICAL DEFENCE TRAINING

VOLUME 1

INDIVIDUAL TRAINING

PAMPHLET No. 5

PERSONAL PROTECTION AND DECONTAMINATION

This pamphlet supersedes "Nuclear Training", All Arms, Volume I, Pamphlet No. 1—Precautions Against Nuclear Attack (Army Code No. 9466, AP 3349), Section 6 and Section 7, paras 96 to 100, 102, 104 to 107 and 110 (*d*) and (*e*) and "Gas Training", 1951 (Army Code No. 8511, AP 3221A), Section 6 and Section 9 paras 1 to 7.

By Command of the Defence Council

J. T. Dunnett

MINISTRY OF DEFENCE
21st March, 1967

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Amendment No.	By whom amended	Date amended

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CHAPTER 2—NUCLEAR PROTECTION

SECTION 3—Protection against the immediate effects of nuclear weapons

Precautionary measures

11. *General.* There may be no warning of a nuclear explosion and the damage from the immediate effects (heat, light, blast and initial nuclear radiation) will be complete soon after the explosion. Therefore, individuals must take precautionary measures when a nuclear attack is considered likely. These precautionary measures are as follows:—

(*a*) Remain under cover, eg., in shelters or cellars, in armoured vehicles or in slit trenches with overhead cover.

(*b*) Keep exposed skin covered, eg., collars must be buttoned up, sleeves must be rolled down and gloves worn. (CB clothing and the respirator will give additional protection to the skin against heat).

(*c*) Personal weapons and equipment must not be left outside cover. Articles left lying about may not only be damaged by heat and blast, but could themselves become dangerous missiles if blown about by blast.

12. *Prepared field defences.* The general principles to be followed when preparing field defences are as follows:—

(*a*) *Trenches.* These should be deep and narrow and have as near vertical sides as possible (*see* Fig 1).

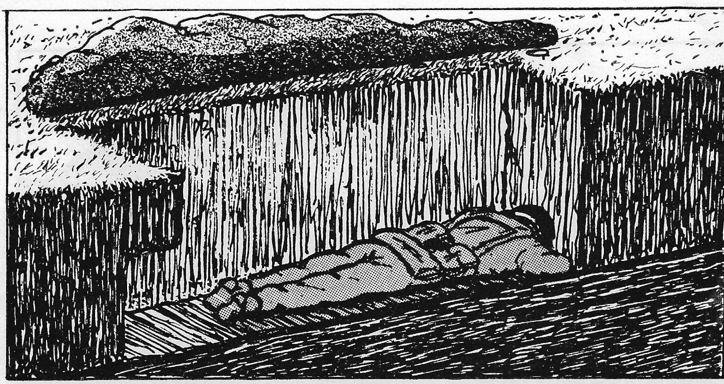

Fig 1—Protection in a slit trench

(*b*) Trenches should be as deep as the ground and the tactical situation will permit. Ideally, they should be four feet six inches deep and not more than two feet wide at the surface.

(*c*) *Overhead cover.* Some form of overhead protection is essential against the effects of heat, blast and radiation. The "Individual Protection Kit" has been designed to provide a lightweight means of supporting the overhead protection for an individual slit trench (*see* Fig 2).

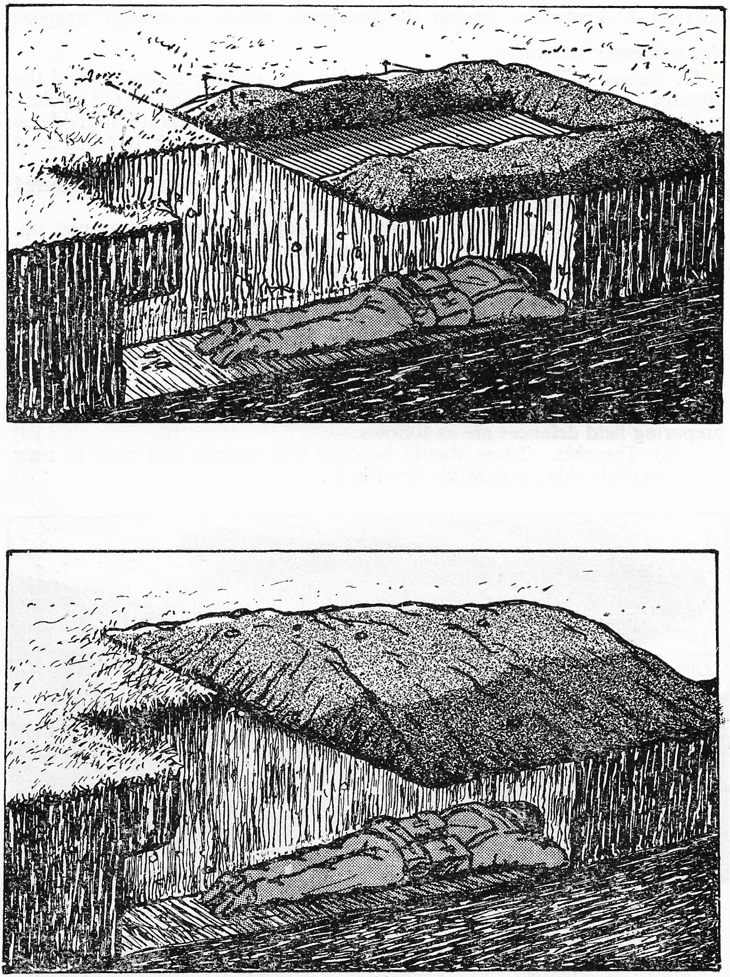

Fig 2—Using the individual protection kit

The value of more solid overhead protection is shown in Figure 3.

Fig 3—The value of overhead cover JAPAN, 1945

Fig 4—Protection against the effects of heat JAPAN, 1945

Protection in the open

13. Ideally, personnel should be sheltered in field defences such as those shown in Figures 1 and 2 or in cellars and basements. If in the latter, particular care must be taken to guard against the danger from falling buildings. All these types of shelter give excellent protection against the effects of heat, light, blast and nuclear radiation. Any cover, no matter how slight, which is between the individual and the explosion, will provide some degree of protection against the effects of heat. For example, even the slight cover of foliage will reduce the heat (*see* Fig 4). — HIROSHIMA

The pattern on the telegraph pole shows where leaves protected the pole from some of the heat effects. Some natural cover can often be found in open country. For example, a ditch, boulders, trees or similar solid objects may provide protection (*see* Fig 5).

A constant awareness of the value of such cover in providing instant protection against the effects of heat is important. This is because both heat and nuclear radiation travel at the speed of light and for all practical purposes can be said to be effective at once. It must be remembered, however, that these objects can become a danger as projectiles when the blast wave arrives. Initial radiation will remain a danger for approximately one minute after the explosion. Personnel in the open, should where possible, undertake their tasks immediately alongside suitable cover such as a ditch or fold in the ground. The effects of blast will not be felt at once since the blast wave travels at roughly the speed of sound, (one mile in five seconds); thus the time when the effects may be expected will vary with the distance from the explosion. The blast wave will be effective for a relatively longer period than blast caused by an HE explosion, ie., up to a second or two as compared with about one thousandth of a second for HE, and it is this fact that makes the blast from a nuclear explosion so dangerous.

Action on attack

14. *The immediate action drill.* The first indication of a nuclear attack will be a **blinding flash of light.** No matter whether in the open or in shelter, on sensing a flash the following immediate action must be taken:—

(*a*) **Close the eyes.**

(*b*) **Drop to the ground face downwards.**

(*c*) If the hands are unprotected keep them under the body.

Some do's and don'ts

15. *Do*

(*a*) *Before an attack*

(*i*) Remain under cover or in a shelter unless it is vital to be in the open.

(*ii*) Keep all exposed skin covered.

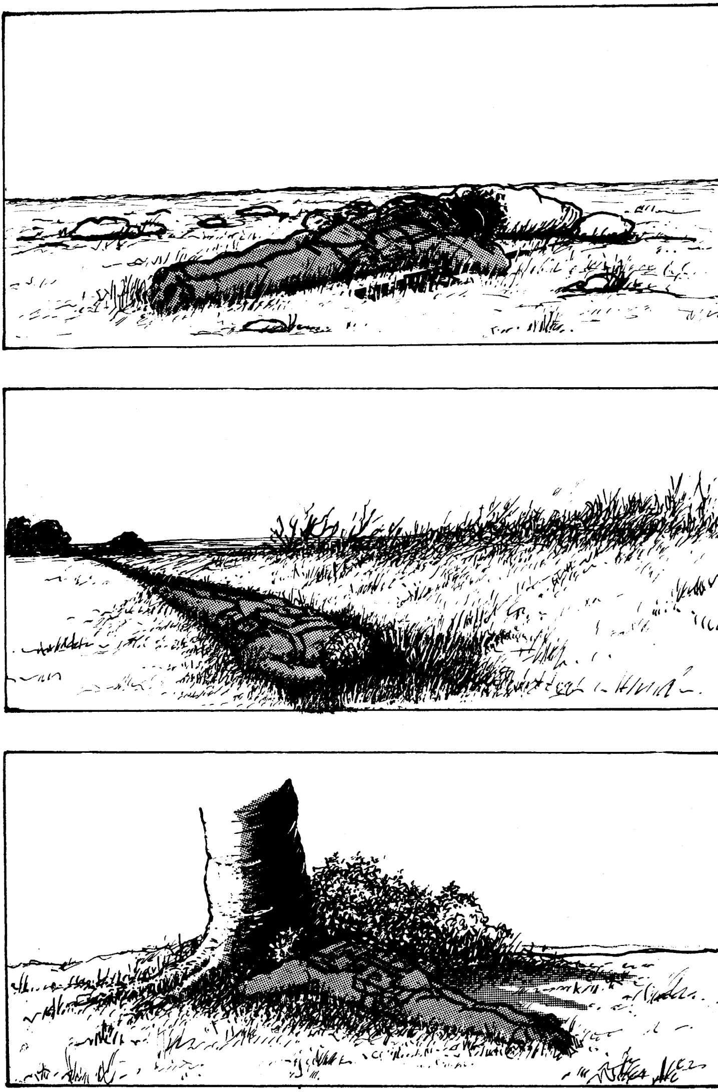

Fig 5—Gaining protection in the open

(*b*) *When an attack occurs*

(*i*) Close the eyes at once on sensing a flash and keep them closed. If the hands are protected shield the face and eyes with the arms. Keep the head down.

(*ii*) Drop to the ground immediately. If in the open and alongside suitable cover, use it.

(*iii*) Remain flat on the ground until the shock wave has passed.

(*iv*) If in a building, after taking the immediate action at once roll clear of any opening and get under, for example, a nearby table, desk or bed and lie flat.

16. *Don't*

(*a*) Don't look at the flash.

(*b*) Don't try to decide the location of the explosion until the shock wave has passed.

(*c*) Don't run for cover when the explosion occurs.

Paras 17–20 *Reserved.*

SECTION 4—Protection against residual nuclear radiation

General

21. Nuclear explosions may cause residual radiation in the form of:—

(*a*) *Induced radiation.* Radiation which is produced from the area of ground in the immediate vicinity of the explosion.

(*b*) *Fallout.* Radioactive dust which may be deposited over a wide are for some hours after the explosion.

Reduction of the hazard

22. The danger from nuclear radiation gradually lessens with time. When operational requirements permit the individual can also reduce the hazard as follows:—

(*a*) *Exposure time.* By keeping to a minimum the time exposed to radiation, eg:—

(*i*) to stay under cover, (*see* sub-paras (*b*) and (*c*) below;

(*ii*) to return to cover immediately after properly completing tasks which have been carried out in the open;

(*iii*) as soon as possible to remove radioactive dust or mud etc. from clothing.

(*b*) *Distance.* By keeping as far away from radioactive contamination as possible, eg:—

(*i*) to remain in the cellar, basement, or inner room of a building rather than in a room near the roof or one with an outer wall;

(*ii*) to stay away from the outside walls of a building;

(*iii*) prevent radioactive dust from entering a slit trench by closing up the exits etc.

(*c*) *Shielding.* By placing the thickest possible shield between the body and the source of radiation, eg:—

(*i*) to get underground or into an armoured vehicle;

(*ii*) to take cover inside the thickest building.

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W.O.
CODE No.
11679

RECOGNITION HANDBOOK *of* FOREIGN WEAPONS & EQUIPMENT

★ U.S.S.R. ★

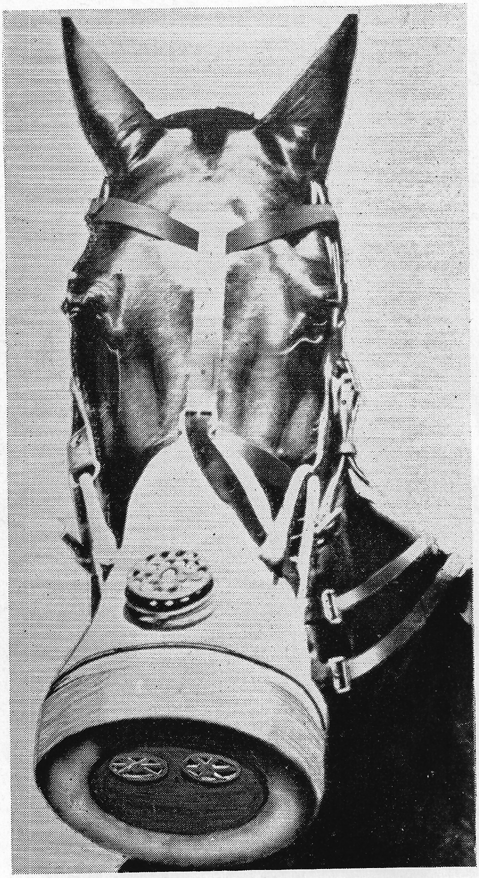
VOLUME 1

PART 6

M.I.10. THE WAR OFFICE

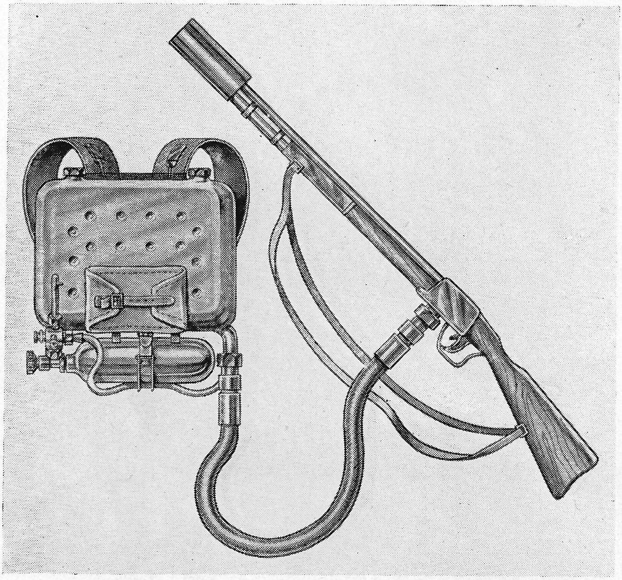
SHLEM-MASKA 1
(with KR-MO-2 canister)

KSP-6 HORSE RESPIRATOR



The KSP-6 model is a dry type respirator with a large cylindrical filter canister fixed to a facepiece made of stockinette covered rubber. Note the two air inlets in the bottom of the filter with wheel-like framing, and the outlet valve on the front protected by a perforated metal grid.

ROKS-2 MANPACK FLAMETHROWER



The rectangular metal fuel container closely resembles a normal pack. The flame gun itself is in the form of a rifle. Ejection is by compressed air, the cylindrical air bottle being attached horizontally beneath the pack. Above the air bottle, attached to the fuel container, is a canvas tool bag. The double trigger action first fires an incendiary cartridge by depressing the small trigger and then releases the flow of fuel by depressing the main trigger.

Weight (charged) :	50 lb.
Capacity :	2 gals.
Number of shots :	6-8 of 1 second duration.
Range :	40-50 yards.

Fuel may be diesel oil or petrol mixed with aluminium stearate.

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CAMT 1-43

CANADIAN ARMY
MANUAL OF TRAINING

NOTES ON THE INFLUENCE OF NUCLEAR WEAPONS ON TACTICS
(PROVISIONAL)

1955

PREPARED UNDER THE DIRECTION
OF
THE CHIEF OF THE GENERAL STAFF

ARMY HEADQUARTERS
OTTAWA

NOTES

ON

THE INFLUENCE OF NUCLEAR WEAPONS ON TACTICS

PROVISIONAL

To be read in conjunction with CAMT 1-42—ATOMIC WEAPONS, their Characteristics and Employment

Introduction

1. Nuclear weapons may now be considered as part of the normal armaments of the major powers. The introduction of these weapons to the battlefield may not take place at the outbreak of war, and if the campaign is small and localized they may not be used at all. It is quite evident that we must be prepared to fight a nuclear war in addition to being ready for war with conventional weapons. The introduction of nuclear weapons may be instantaneous and could come without warning. Should a major war break out it is likely that nuclear weapons will be available to both sides in ample supply. In such a war is is improbable that a commander will be unduly restricted in the number or types of missiles he can use.

2. Weapons now available, or under development, have a variety of sizes and means of delivery. It must be assumed that a major power will be able to employ the size and type of missile most suited to a particular task.

SECTION I—GENERAL

3. In planning future operations, the commander will seek to entice or force his enemy to deploy in such a manner that he presents a favourable nuclear target while at the same time deploying his own force in such a way that it does not present a favourable target to the enemy. To the two accepted principal determinants of battle—firepower and movement will be added a third—control.

Ground

4. Ground will continue to be of major importance in the tactical battle. Certain types of ground, such as hilly features can reduce the

effects of nuclear explosions. Ground is also of importance to give observation; to secure essential communications; to restrict or canalize enemy movements and to cover the movement and operation of reserves.

Principles of War

5. The accepted principles of war remain applicable to nuclear warfare as discussed below.

(*a*) *Maintenance of the Aim* = BREAK ENEMY'S WILL TO FIGHT!!

In nuclear warfare opposing commanders will always be trying to force their opponents to concentrate, thus providing a suitable target for nuclear weapons. In any plan this is the dominant factor.

(*b*) *Surprise*

The instantaneous effect of a nuclear explosion is in itself an application of surprise. By careful planning the commander may exploit this surprise by rapid ground action before the effects wear off.

(*c*) *Offensive Action* = DESTROY ENEMY CAPABILITY!!

The nuclear weapon is capable of turning defeat into victory; defence into offence. Its effects must be exploited fully and immediately.

(*d*) *Concentration*

In nuclear warfare concentration will be in terms of time rather than space. The use of a nuclear weapon is in itself a great concentration of effort. Its effects must be co-ordinated with the other resources available to the commander in order to achieve the fulfilment of his plan.

(*e*) *Maintenance of Morale* = DETERMINATION!!

The morale effect of the use of nuclear weapons may be great. Every soldier must be taught what to expect and how to protect himself. The rallying of men on the spot after a nuclear attack should be immediate and will place greater responsibility on junior leaders.

(*f*) *Security*

The use of nuclear weapons will, no doubt, bring greater dispersion of forces than in conventional warfare. This will increase the security problem. A commander will require to

keep his force concentrated in terms of time with consequent emphasis on better communications, mobility and flexibility. The principle of security implies that no action of the enemy will divert a commander from his aim and he must therefore be prepared to receive and withstand enemy attack by nuclear weapons.

(*g*) *Mobility and Flexibility*

The rapid concentration of effort required in nuclear warfare will call for greater mobility and flexibility. Command and control techniques must, therefore, be simple and efficient. All arms and services must be able to move freely and quickly by night.

(*h*) *Economy of Effort*

Nuclear weapons will present many opportunities for a numerically weaker force to defeat a stronger one. Such weapons may alter the composition of forces needed to obtain success.

(*j*) *Administration*

In nuclear warfare the logistical organization will be more vulnerable than ever before to enemy action. Tactical aims may be attained by imposing administrative impotence on an enemy. Dispersion is essential, as well as streamlining the supply organization. Economy and restraint in the use of war material will be required at all levels.

Command and Control

6. The decision to employ nuclear missiles rests with the commander who has been allocated these weapons and delegated the authority to employ them. At present this will be the Army or Corps Commander. Normally Army Headquarters/Tactical Air Group will control the allotment of nuclear missiles.

7. Requests for nuclear fire support may originate with any tactical commander who has identified a suitable target or whose task will be materially assisted by such support. The decision for employment will depend upon supply and upon information from reconnaissance and intelligence agencies.

Reconnaissance

8. In nuclear warfare reconnaissance takes on a new significance. Air reconnaissance will be required by visual, photo and electronic means.

There must also be a system for the rapid evaluation and assessment of all information received so that a commander may know when a suitable target for nuclear weapons has been located.

9. Every available method of ground reconnaissance, supplemented by the use of light aircraft, must be used in the forward areas. All troops must be made thoroughly aware of the importance of recognizing and passing back any information which may assist our intelligence staffs to assess and evaluate possible targets. Patrol activity must be increased to provide continuous coverage of the enemy front by observation and for the capture of PWs. Trained reconnaissance troops sufficiently strong to fight for information on a considerable scale will be required for deep and medium reconnaissance. Contact with the enemy must be continuous.

Intelligence

10. The intelligence resources of the commander in nuclear warfare must be of a high order. It is essential that the time required to secure, report interpret, evaluate and disseminate information is reduced to a minimum. In order that our own nuclear weapons may be used with maximum effect, information from reconnaissance elements must be processed quickly. In addition emphasis will be placed on the detection of enemy intentions regarding the use of nuclear weapons so that our troops may take protective action. To this end technical staffs of personnel trained in scientific aspects of nuclear warfare will be required to assess and evaluate targets and enemy preparations and to work out technical details.

11. As surprise employment of a nuclear weapon increases its tactical effectiveness, special emphasis will be placed on counter intelligence measures, both active and passive, to conceal our activities and to neutralize or detroy the effectiveness of enemy intelligence. These measures will include air defence to deny enemy aerial observation and smoke to cover our movements.

SECTION II—SELECTION OF TARGETS

General

12. The tasks selected for nuclear weapons, will be primarily those which cannot be performed as effectively by conventional weapons. Two factors are considered in selecting suitable targets.

(*a*) their importance in relation to the tactical situation,

(*b*) their strength and composition.

13. The importance of targets will be judged on their relationship to the overall plan. Under certain circumstances, nuclear attack may well be justified on targets which of themselves would not be considered suitable.

14. Selection of suitable targets will depend on early and complete information. The planning of a nuclear strike is time consuming and will include considerations of weather, type of burst, means of delivery, position of our own troops with relation to the target and possible psychological effects of the explosion on enemy, own troops and local population.

Types of Targets

15. Targets are of three categories:

(*a*) *Pre-planned targets*

These are targets which have been indentified before the operation commences and which can be attacked at a specific time and place. These will include airfields, administrative installations, defiles and major bridges, known enemy positions and headquarters.

(*b*) *Contingent targets*

These are targets for which a considerable amount of data can be prepared in advance and which can be engaged relatively quickly. These will include likely enemy concentrations or assembly areas, possible gun areas, river crossing sites and old bridgeheads.

(*c*) *Opportunity targets*

These are targets which cannot be forecast and which may be only in existence for a short time. The successful engagement of opportunity targets will depend on early recognition, and adequate communications; to these must be added an efficient system for processing and evaluating information received. If it is possible to pre-plan for the rapid delivery of nuclear weapons by the air force, this may be the best way to engage "opportunity targets". However, because of the fleeting nature of these targets, it may be more advantageous to use guided missiles or long range artillery with nuclear warheads, since these can be brought more quickly onto the target.

1951 RESTRICTED WO, Code 8666.

U.K. WAR OFFICE:

FIELD ENGINEERING AND MINE WARFARE

PAMPHLET No. 2

FIELD DEFENCES AND OBSTACLES

PART I — ALL ARMS

INTRODUCTION

1. It is a primitive instinct of man to lie down and take cover when under fire ; but in this position he cannot use his weapons and hit back. Field defences are therefore constructed by a disciplined army to enable the soldiers to use their weapons offensively against the enemy, while at the same time deriving protection against the enemy's fire.

2. It is essential that every soldier should know how to construct and conceal field defences which will confer upon him this ability to use his weapons offensively while reducing to a minimum his own risk of becoming a casualty.

3. This pamphlet describes the principles and practice of constructing and concealing field defences and obstacles mainly from the engineering aspect. The tactical principles of siting field defences and obstacles are covered in the relevant Military Training and Infantry Training pamphlets, parts of which are quoted here to make this pamphlet, in itself, complete.

CHAPTER 1

GENERAL CONSIDERATIONS IN THE CONSTRUCTION OF FIELD DEFENCES

SECTION 1.—ALL ARMS RESPONSIBILITIES

1. All arms are responsible for the provision of their own field defences. This responsibility covers:—

(*a*) The siting, construction (including revetting and draining), and concealment of weapon pits and light splinter-proof shelters.

(*b*) Siting, construction and concealment of obstacles, and clearance of the field of fire except where explosives are required for the purpose.

(*c*) Improvements to communications, *eg*, crawl trenches, tracks.

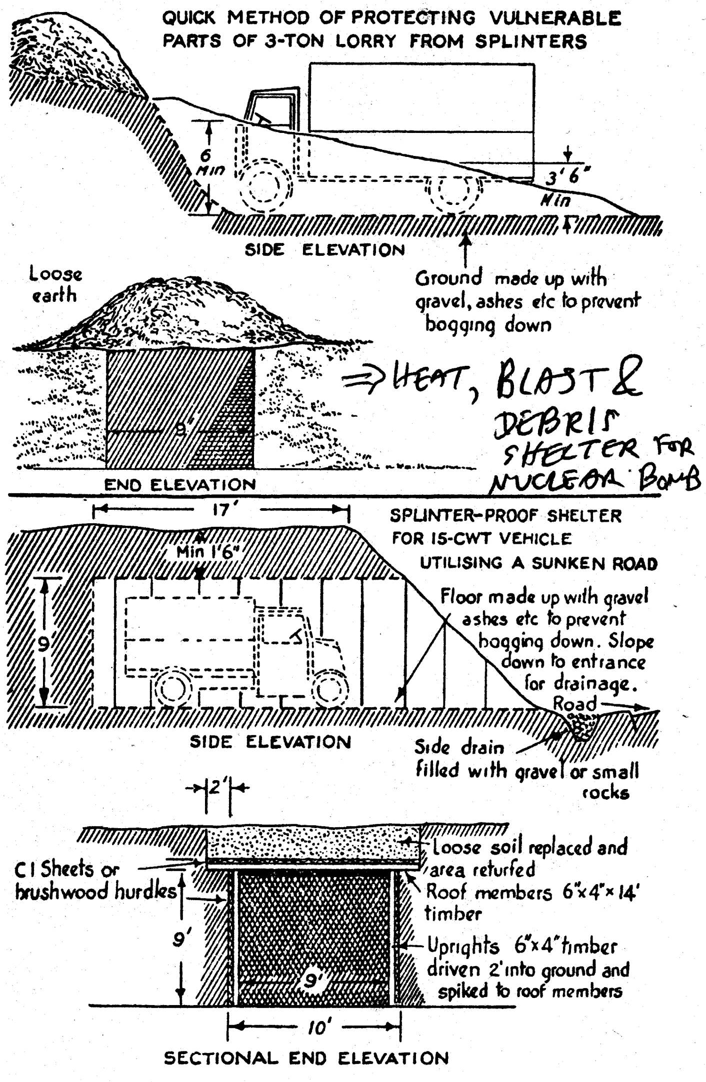


Fig 33.—Digging-in vehicles (ii)

11. Fig 34 gives a suggested layout for a divisional tactical HQ.

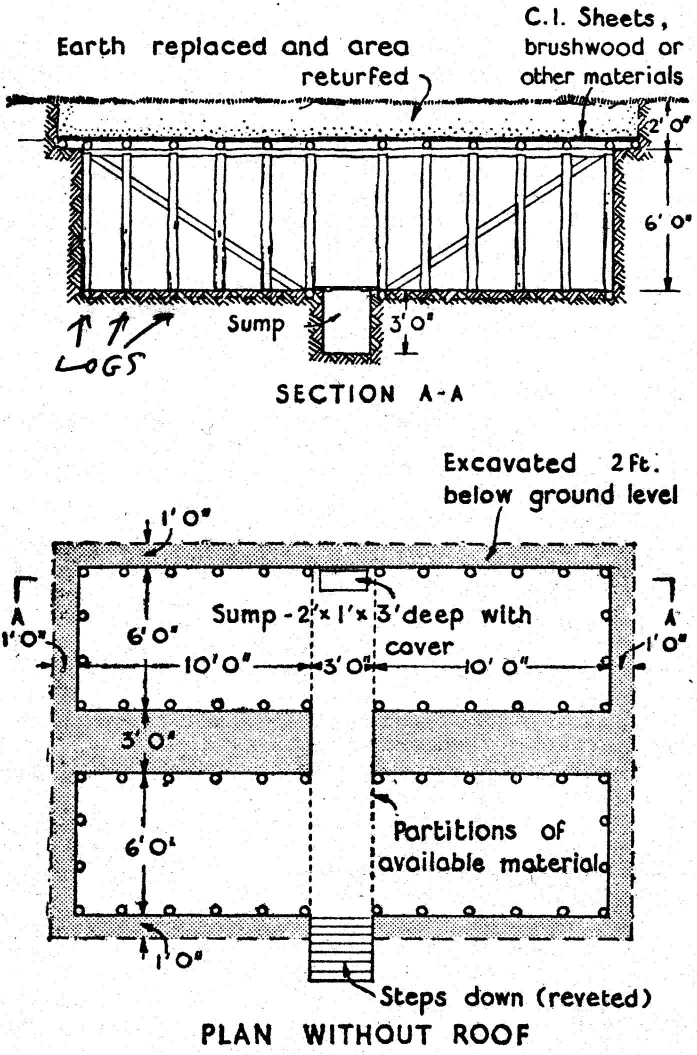


Fig 34.—Divisional tactical HQ splinter-proof shelter

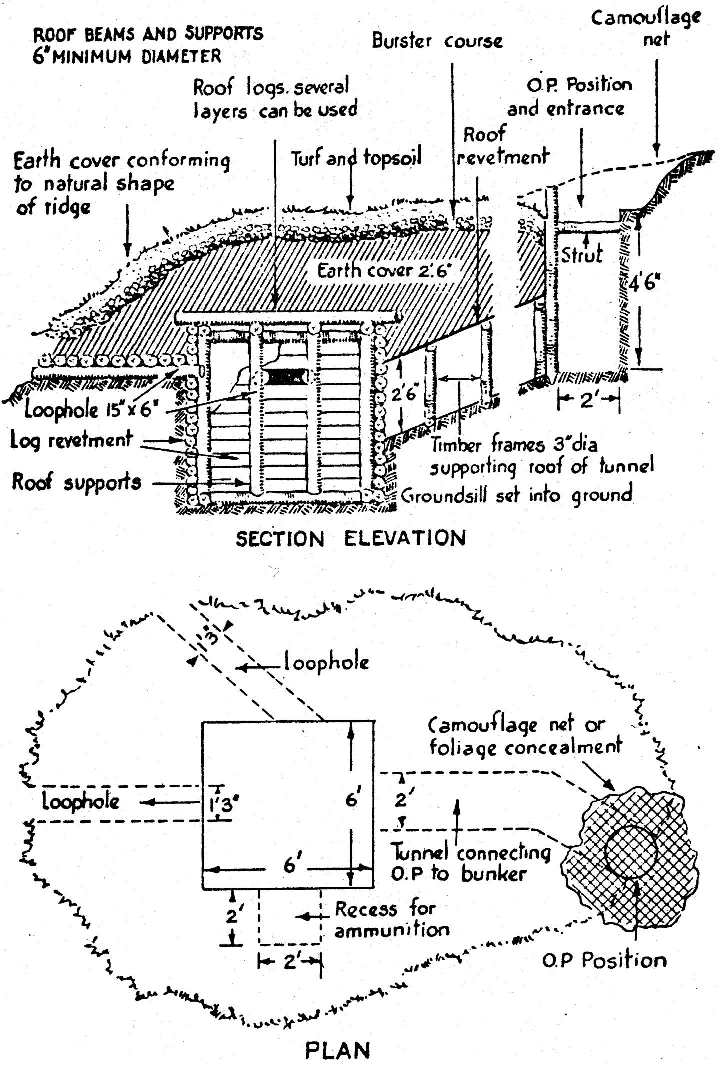


Fig 37.—Bunker position

APPENDIX C

PROTECTION REQUIRED AGAINST DIFFERENT TYPES OF FIRE

The table below shows the thickness of materials required to resist penetration by various missiles.

Type of material	Type of material in inches						
	Horizontal trajectory				Vertical trajectory		
	SA bullets, AP and HE fragments	AP shot		Air-burst or tree-burst HE fragments	Direct hit from mortar bombs up to 10 lb in weight	Direct hit from shell up to 40 lb in weight	Direct hit from heavy shell or aircraft bomb up to 500 lb in weight
		6-pr	17-pr				
(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	(*g*)	(*h*)
Earth or chalk	60	360	684	18 (w)	30	90	720 (x)
Sand	30	360	684	18 (w)	30	90	720 (x)
Brick	18	(y)	(y)	18 (w)	(y)	(y)	(y)
Timber	60 (x)	(y)	(y)	9 (x)	(y)	(y)	(y)
Shingle (between boards)	12	240	456	12	(y)	(y)	(y)
Unreinforced concrete ..	12	(y)	(y)	4	9	18	60
Reinforced concrete ..	12	60	114	4	9	15	48
Mild steel	1¾	(y)	(y)	½	2	(y)	(y)
Ice concrete	6	(z)	(z)	(z)	(z)	(z)	(z)
Frozen packed snow ..	36	(z)	(z)	(z)	(z)	(z)	(z)

NOTES.—(w) 12 inches gives nearly full protection.
(x) Very variable.
(y) Information of no value.
(z) Information not yet available.

APPENDIX E

STORES REQUIRED FOR COMPANY HQ COMMAND POST SHELTER

Timber round three-inch diameter foot run	210
„ „ four to six inches diameter foot run	180
CGI sheets or other revetting metal for roof, square feet ..	40
CGI sheets or other revetting metal for walls, square feet ..	190
Wire 14 SWG, feet	1,000
Spikes nine-inch	50
Nails six-inch	40
„ three-inch	100
Hessian for curtains four feet by two-feet six-inch sheets ..	2
Pickets forestry two feet six inches long by three-inch diameter ..	10

APPENDIX F

SIZE OF ROOF BEAMS

Spacing of beams two feet centre to centre.

1. Rectangular section timber

Size of timber (ins)	Maximum span (ft)	
	For 1 ft 6 ins earth	For 3 ins earth
6×2	5	4
9×2	8	6
7×2½	6	5
6×3	6	5
8×3	8	6
9×3	9	7
4×4	5	4
5×4	6	5
7×4	9	7
9×4	12	9
5×5	6	5
7×5	9	7
9×5	13	10
6×6	9	7
8×6	12	9
8×8	15	11
9×9	17	13

2. Circular section timber

Size of timber (ins)	Maximum span (ft)	
	For 1 ft 6 ins earth	For 3 ins earth
4	3	3
5	5	4
6	7	5
7	9	7
8	11	8
9	13	10

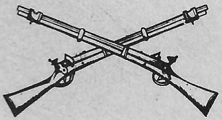
3. RSJs

Size of timber (ins)	Maximum span (ft)	
	For 1 ft 6 ins earth	For 3 ins earth
6×3	18	13
5×3	16	12
4×3	14	10
3×3	11	8
$4 \times 1\frac{3}{4}$	9	7
$3 \times 1\frac{1}{2}$	7	5
80 lb rail	23	17

The above tables are calculated for a working stress in timber of 1,340 lb/sq inch and in steel of $7\frac{1}{2}$ tons/sq in. Weight of earth has een taken as 100 lb/cu ft.

Infantry
THE PROFESSIONAL MAGAZINE FOR INFANTRYMEN

LEADER'S HANDBOOK



Published at the US Army Infantry School

by

INFANTRY Magazine

July 1962

TROOP LEADING STEPS

1. BEGIN PLANNING
   a. Plan the use of available time.
   b. Begin the estimate of the situation.
      (1) Analyze terrain from map, sketch, or aerial photograph for:
         (a) Observation and fields of fire.
         (b) Cover and concealment.
         (c) Obstacles.
         (d) Critical terrain features.
         (e) Avenues of approach.
      (2) Analyze enemy strength, locations, dispositions, and capabilities.
   c. Make preliminary plan.
2. ARRANGE FOR:
   a. MOVEMENT OF UNIT (Where, when, how)
   b. RECONNAISSANCE (Select route, schedule, persons to take along, use of subordinates)
   c. ISSUE OF ORDER (Notify subordinate leaders of time and place)
   d. COORDINATION (Adjacent and supporting units)
3. MAKE RECONNAISSANCE: (Continue estimate, complete terrain analysis. If necessary change preliminary plan)
4. COMPLETE PLAN: (Receive recommendations, change preliminary plan as needed, prepare order)
5. ISSUE ORDER: (Include terrain orientation)
6. SUPERVISE

ESTIMATE OF THE SITUATION

1. MISSION
2. SITUATION AND COURSES OF ACTION
   a. Weather, terrain, comparison of enemy and friendly situation.
   b. Enemy capabilities.
   c. Own courses of action.
3. ANALYSIS OF OPPOSING COURSES OF ACTION (Analyze effect of each enemy capability on each of own courses of action)
4. COMPARISON OF OWN COURSES OF ACTION (Summarize advantages and disadvantages of own courses of action)
5. DECISION (Who, what, when, where, how and why)

CHARACTERISTICS OF INFANTRY WEAPONS

WEAPON & WEIGHT	Type of Feed	Method of Operation	Cyclic(C) or Maximum Rate (M) of fire (Rds per Min)	Sustained Rate of Fire (Rds per Min)	Maximum Effective Rate of Fire (Rds per Min)	Maximum Range (Nearest 25 Meters)	Maximum Effective Range (Meters)	Approximate Effective Bursting Area (in meters)	REMARKS
HAND GRENADES Fragmentation M26A2 1 WP M34 1.5						50 35		15 25	May be fired as a Rifle Grenade using M1 A2 Projection Adapter.
WEAPON ANTIPERSONNEL M18A1 Claymore 3.5				Controlled Electric or Uncontrolled Trip Wire	1 Shot	200	Most Effective 50	Directional Fragmentation 90° sector w/radius of 50	Check TC7-3 for back-blast effects. When used uncontrolled Claymore must be treated as a mine and its location recorded
US RIFLE 7.62mm, M14 9.7	20 Rd Mag	Gas Operated Semi-auto and auto	700-760 (C)	15 Semiautomatic 20-Automatic	20-40 Semiauto 40-60 Auto	3200	460		Full auto capability requires installation of selector. Sustained rate based on limited tests. Bipod is a major item and used in conjunction with rifle when used as an auto rifle.
US RIFLE, 7.62mm, M14 WITH RIFLE GRENADE LAUNCHER M76, HEAT RIFLE GRENADE, M31 AND SIGHT M15 10.5	Manual	Manual Single Shot	4 (M)	4	2	275	125		Grenade launcher w/M15 sight weighs approx 1 lb. Complete round weighs approx 1.5 lbs.
MACHINEGUN, 7.62mm, M60 23	Belt Metallic Link	Gas Operated Auto	550 (C)	100	200	3200	1100		Max effective range limited by gunner's ability to see and adjust on target.
40mm GRENADE LAUNCHER M79 6.25		Percussion Type Single Shot				400	400	5	Min safe range: Combat: 31 meters Training: 50 meters
US CARBINE CAL .30, M2 5.5	30 Rd Mag	Gas operated Semi-auto and auto	750-775 (C)	40-60	40-60	2025	250		To be replaced by M14 Rifle. May be equipped with sniperscope infrared set No 1 20,000 Volts.
US RIFLE CAL .30, M1 9.5	8 Rd Clip	Gas Operated Semi-automatic		8-10	16-24	3200	460		To be replaced by M14 Rifle.

US RIFLE, M1, w/GRENADE LAUNCHER M7A3, HEAT RIFLE GRENADE M31 & SIGHT M15 10.5	Manual	Manual Single Shot	4 (M)	4	2	275	125		Complete round weighs approx 1.5 lb.
BROWNING AUTOMATIC RIFLE CAL .30 M1918A2 19.5	20 Rd Mag	Gas operated auto	350 (C) Slow 350 (C) Fast 120-150 (M)	40-60	40-60 (2-3 rd bursts) 120-150 (20 rd bursts)	2750-3200	460		To be replaced by M14 rifle with M2 bipod.
BROWNING MACHINE GUN, CAL.30, M1919A6 33	Belt Metallic Link	Recoil Auto	600-675 (C)	75	150	3200	1100		Max effective range limited by gunner's ability to see and adjust on target. May be fired from tripod mount. To be replaced by M60.
MACHINEGUN, CAL .50 HB, M2 126	Belt Metallic Link	Recoil Semiauto and Auto	500 (C)	40	100	6800	725 AA Target 1825 Ground Target		
PORTABLE FLAME-THROWER, M2A1-7 40.5	Fuel propelled by gas under pressure	Manual	Continuous Discharge 6-9 Sec	Continuous Discharge 6-9 Sec	Continuous Discharge 6-9 Sec	25 Unthickened Fuel 50 Thickened Fuel	Same as Maximum		Contains 4.5-4.75 gal of fuel weighing 25 to 29 lbs.
M4 INCENDIARY BURSTER 2.25		Blasting cap fuze or any standard firing device						5 gal container 20-30 55 gal container 85	Any size container. Fired electrically or mechanically by fuze, blasting cap or any standard firing device.
81mm MORTAR, M29 WITH MOUNT, M23A3 93.5	Muzzle Loading by Hand	Drop Fire	12 (M) for 2 Min w/Charge 8	3 with Charge 8		3650	3650	25x20(A)	Ammunition weighs 7-12 pounds (A).
4.2-IN MORTAR, M30 WITH MOUNT, M24A1 640	Muzzle Loading by Hand	Drop Fire	20 (M) for First 2 Minutes 6 Per Min Next 20 Min	2		5500	5500	40x15(A)	Ammunition weighs 26-29 pounds. (A)

TANK - ANTITANK - RECOILLESS WEAPONS

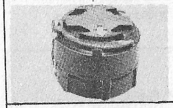
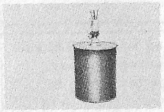
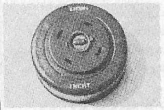
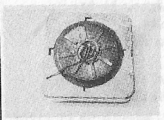
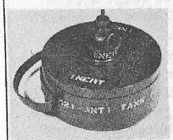
Cyclic Rate of Fire ---------Rate at which weapon fires automatically.
Maximum Rate of Fire (M) ---Greatest rate at which well-trained gunner can fire.
Sustained Rate of Fire -------Rate at which weapon can fire indefinitely without seriously overheating.

Maximum Effective Rate ----Rate at which trained gunner can fire and obtain reasonable number of hits (50%).
Maximum Range -----------Greatest distance weapon will fire.
Maximum Effective Range --Greatest distance at which gunner may be expected to fire accurately.

WEAPON (wpn.wt. /ammo. wt.)	RATE OF FIRE (Per Minute) MAXIMUM	SUSTAINED	MAXIMUM RANGE METERS	EFFECTIVE RANGES METERS ARMOR-DEFEATING	OTHER TARGETS	APPROX BURSTING AREA
3.5 IN ROCKET LAUNCHER M20A1B1 13/9	12-18	4	825	H-185-Moving (1, 8) H-275-Stationary (1, 2, 8)	275 (1, 2, 7)	18 x 9 (HEAT)
106mm RIFLE M40A1 w/SPOTTING RIFLE CAL .50 M8 460/37	1 per 6 sec not to exceed 5; then 15 min cooling period	1 per min indef	7700	H-1100 (3) H-2200 yds (4)	2200 yds (11) as determined by nature of target	14m radius (HEP-T)
90mm FULL TRACKED SELF-PROPELLED GUN, M56 15,000	6	1	17,154	H-4600-HEAT (5, 8) L-2250-APT (5, 8, 16) M-1450-APT (5, 8, 16) H-925-APT (5, 8, 16) M-2250-HVAP (5, 8, 16) H-1475-HVAP (5, 8, 16)	4600 (4)	37 x 6 (HE)
76mm GUN TANK M41A1 (Walker) 52,000	7	1	21,607	L-1825-APT (5, 8, 16) M-1250-APT (5, 8, 16) H-926-APT (5, 8, 16) H-1825-HVAP (5, 8, 16) H-1825-HVAP-DS-T (5, 8, 16)	4600 (4)	30 x 5 (HE)
90mm GUN TANK M48A2 104,000	7	1		H-4400-HEAT (5, 8) L-2250-APT (5, 8, 16) M-1450-APT (5, 8, 16) H-925-APT (5, 8, 16) M-2250-HVAP (5, 8, 16) H-1475-HVAP (5, 8, 16)	4400 (4)	37 x 6 (HE)
SS-10 ANTITANK GUIDED MISSILE 15/13	2-3 (9)	2-3 (9)	1600 (10)	H-1600 (8, 10)	450 to 1600	
90mm RIFLE M67 (MAW) 35/9	Unknown	Unknown	Unknown	(14)	700 (11)	Unknown
M72, LIGHT ANTITANK WEAPON 66mm (LAW) 4.5	(13)	(13)	1000	250	325 (11) (12)	(14)
105mm GUN TANK, M60 102,000	7	1	22,290	H-4400-HEP (5, 8) H-2000-APDS (5, 8, 16) H-4400-HEAT (5, 8)	4400	(14)
ENTAC ANTITANK GUIDED MISSILE 37.5/26.7	2-3 (9)	2-3 (9)	2000 (15)	H-2000 (8, 15)	400 to 2000 (12, 15)	Unknown

REMARKS

1. Recommended by USAIS based on skill of average gunner.
2. Max eff range for firing in prone position.
3. Max eff range of weapons system.
4. Max sight graduations primary direct fire sight.
5. Armor defeating capabilities limited by capability of ammo, nature of target, observation, visibility.
6. Approx wt to nearest 25 lbs.
7. Against area targets 825m.
8. Eff armor defeating ranges against L-Light, M-Medium, H-Heavy tanks.
9. Depending on flight time to target.
10. Min practical range 450m based on gunner's ability.
11. Max range graduations on sight.
12. Primarily an AT wpn; should be conserved for this purpose.
13. Launcher discarded after firing.
14. Classified information.
15. Min practical range approx 400 meters based on gunner's proficiency.
16. Kinetic energy rds are the primary armor-defeating tank rounds. Altho their max eff ranges are greater, they are treated as though their max eff ranges were 1500m or less. This is normal US Army tank fighting area.

MINE	TYPE	ACTION REQUIRED TO DETONATE	EFFECT
 MINE, ANTI-PERSONNEL, NONMETALLIC, M14	Stationary blast	Individual steps on mine (15 or more lbs of pressure).	Individual detonating mine becomes non-lethal casualty.
 MINE, ANTI-PERSONNEL, M16	Bounding fragmentation (projectile jumps)	Individual stumbles on trip wire or steps on fuze (3 or more lbs of pull or 8 or more lbs of pressure).	Half of personnel w/in radius of 30 meters become casualties.
 MINE, ANTI-TANK, M15	Blast	Vehicle runs over pressure plate (300 or more lbs of pressure).	Immobilizes heaviest armor by breaking tracks.
 MINE, ANTI-TANK, NON-METALLIC, M19	Blast	Vehicle runs over pressure plate 350 or more lbs of pressure).	Immobilizes heaviest armor by breaking tracks.
 MINE, ANTI-TANK, M21	Shaped Charge	W/extension rod, veh runs over pressure plate with 290 lbs or more pressure. W/extension rod, a min horizontal force of 4 lbs against extension rod will cause mine to detonate.	w/o extension rod, immobilizes heaviest armor by breaking tracks. W/extension rod explosive charge propels steel plate with sufficient force to penetrate tank belly killing occupants.

CONVERSION FACTORS

Multiply	by	to obtain
centimeters	.03281	feet
centimeters	.3937	inches
cubic feet	.02832	cubic meters
cubic meters	35.31	cubic feet
degrees	60	minutes (circular)
feet	30.48	centimeters
feet	.3048	meters
feet per minute	.01136	miles per hour
feet per second	.6818	miles per hour
gallons (British)	1.201	gallons (US)
gallons (US)	.8327	gallons (British)
inches	2.540	centimeters
inches	.08333	feet
inches	1000	mils
kilometers	.6214	miles
meters	100	centimeters
meters	3.281	feet
meters	39.37	inches
meters	1.094	yards
miles	5280	feet
miles	1.609	kilometers
mils	.001	inches
square meters	10.76	square feet
square meters	1.196	square yards
square miles	2.590	square kilometers
square yards	.8361	square meters
temp (°C) + 17.8	1.8	temp (°F)
temp (°F) — 32	.5556	temp (°C)
yards	.9144	meters

CONDUCTING PRACTICAL WORK

1. Give detailed directions to students.
2. Be sure that students know the "how" and "why."
3. Inform students as to standards expected.
4. Allow sufficient time to attain standards set.
5. Keep instruction first, production secondary.
6. Supervise closely and constantly.
7. See that men perform correctly.
8. Learn each step before progressing to the next.
9. Reteach and redemonstrate when need arises.
10. Stress both speed and accuracy after procedure is learned.
11. Make application realistic.
12. Ask pertinent questions during practical work.
13. Be patient and encouraging.
14. See that all safety precautions are observed.
15. Show positive interest in student progress.
16. Have good students aid slower students.
17. Help students evaluate their performance.
18. Rotate students from one job to another.

HOW TO CONDUCT A CRITIQUE

(All applicatory exercises should close with a critique)

1. State the objective of the lesson or problem.
2. Review procedures employed.
3. Evaluate strong points and suggest improvements.
4. Control the group in discussion.
5. Summarize.

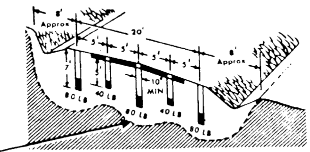
CRATERING CHARGES

DELIBERATE ROAD CRATER

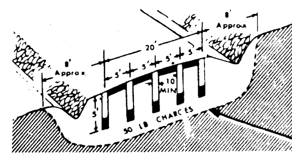
ALTERNATE 5-FOOT AND 7-FOOT HOLES SPACED AT 5-FOOT INTERVALS.
(END HOLES ALWAYS 7-FOOT)

USE 40-LB CHARGES IN 5-FOOT HOLES AND 80-LB CHARGES IN 7-FOOT HOLES.

RESULTING CRATER APPROX. 8-FEET DEEP AND 25-FEET WIDE.



HASTY ROAD CRATER



HOLES OF EQUAL DEPTH, (2½ FEET TO 5 FEET) SPACED AT 5-FOOT INTERVALS.

USE 10-POUNDS OF EXPLOSIVES PER FOOT OF DEPTH.

RESULTING CRATER DEPTH APPROX. 1½ TIMES DEPTH OF BORE- HOLES.

WIDTH APPROX. 5 TIMES DEPTH OF BORE-HOLES.

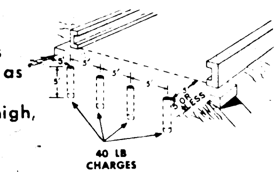
BRIDGE ABUTMENT DESTRUCTION

ABUTMENTS 5 FEET OR LESS IN THICKNESS

Beginning 5 feet in from one side of road, place 40 lb. cratering charges in holes 5 feet deep, 5 feet on centers and 5 feet behind river face of the abutment.

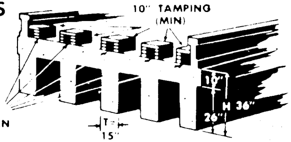
ABUTMENTS MORE THAN 5 FEET IN THICKNESS

Calculate charges by breaching formula and place against rear face at a depth equal to thickness of abutment and space the same as other breaching charges.
(When abutment is over 20 feet high, add a row of breaching charges on the river face at the base of the abutment and fire all charges simultaneously)



PRESSURE CHARGES

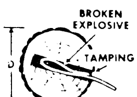
POUNDS = $3H^2T$



HEIGHT OF BEAM IN FEET	POUNDS OF TNT FOR EACH BEAM (TAMPED CHARGES) — THICKNESS OF BEAM IN FEET								
	1 (12 IN)	1¼ (15 IN)	1½ (18 IN)	1¾ (21 IN)	2 (24 IN)	2¼ (27 IN)	2½ (30 IN)	2¾ (33 IN)	3 (36 IN)
1 (12 IN)	3								
1¼ (15 IN)	5	6							
1½ (18 IN)	7	9	11						
1¾ (21 IN)	10	12	14	16					
2 (24 IN)	12	15	18	21	24				
2¼ (27 IN)	16	19	23	27	31	35			
2½ (30 IN)	19	24	29	33	38	43	47		
2¾ (33 IN)	23	29	34	40	46	51	57	63	
3 (36 IN)	27	34	41	48	54	61	68	75	81
3¼ (39 IN)	32	40	48	56	64	72	80	88	95
3½ (42 IN)	37	46	56	65	74	83	92	101	111
3¾ (45 IN)	43	53	64	74	85	95	106	116	127
4 (48 IN)	48	60	72	84	96	108	120	132	144
4¼ (51 IN)	55	68	82	95	109	122	136	149	163
4½ (54 IN)	61	76	92	107	122	137	152	167	183
4¾ (57 IN)	68	85	102	119	136	153	170	187	203
5 (60 IN)	75	94	113	132	150	169	188	207	225

TIMBER CUTTING CHARGES

INTERNAL CHARGES



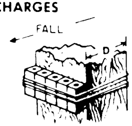
POUNDS = $\frac{D^2}{250}$

WHERE D IS THE LEAST DIMENSION IN INCHES

EXTERNAL CHARGES

POUNDS = $\frac{D^2}{40}$

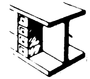
WHERE D IS THE LEAST DIMENSION IN INCHES



TYPE OF CHARGE	EXPLOSIVE	CHARGE UNIT	LEAST DIMENSION OF TIMBER IN INCHES									
			6	8	10	12	15	18	21	24	30	36
			BLOCK OR POUNDS OF EXPLOSIVES									
INTERNAL	ANY	LB.	½	½	½	1	1	1½	2	2½	4	6
EXTERNAL	TNT	LB.	1	2	2½	4	6	9	11	15	23	33

STEEL CUTTING CHARGES

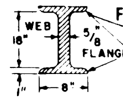
COMMON STEEL MEMBERS



POUNDS (EXPLOSIVE)= 3/8 × AREA OF CROSS SECTION IN SQ. IN.

'Calculate rectangular areas and add, to obtain total area).

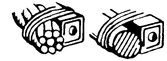
EXAMPLE PROBLEM



FLANGES: WIDTH= 8 IN.
THICKNESS= 1 IN.
FROM TABLE, CHARGE= 3.0
WEB: WIDTH= 18 IN.
THICKNESS= 5/8 IN.
FROM TABLE, CHARGE= 4.3

CHARGE: 2 FLANGES= 2×3.0= 6.0
WEB= 1×4.3 = 4.3
TOTAL 10.3
(USE 11 POUNDS EXPLOSIVES)

CABLES, RODS AND BARS



POUNDS (TNT) = diameter ^{2} (P = D^2) in inches when diameter equals 2" or less (when more use P = 3/8A)

FOR SQUARE BARS
POUNDS= AREA OF CROSS-SECTION IN SQUARE INCHES WHEN DIAMETER OR DIMENSION IN CONTACT WITH EXPLOSIVE EQUALS 2 INCHES OR LESS
(When more, use P= 3/8 AREA)

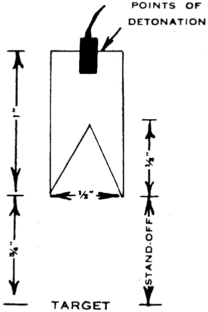
Average Thickness of Section in Inches	POUNDS OF TNT FOR RECTANGULAR STEEL SECTIONS OF GIVEN DIMENSIONS — WIDTH OF SECTION IN INCHES												
	2	3	4	5	6	8	10	12	14	16	18	20	24
1/4	.2	.3	.4	.5	.6	.8	1.0	1.2	1.3	1.5	1.7	1.9	2.3
3/8	.3	.5	.6	.7	.9	1.2	1.4	1.7	2.0	2.3	2.6	2.8	3.4
1/2	.4	.6	.8	1.0	1.2	1.5	1.9	2.3	2.7	3.0	3.4	3.8	4.5
5/8	.5	.7	1.0	1.2	1.4	1.9	2.4	2.9	3.3	3.8	4.3	4.7	5.7
3/4	.6	.9	1.2	1.4	1.7	2.3	2.8	3.4	4.0	4.5	5.1	5.7	6.8
7/8	.7	1.0	1.4	1.7	2.0	2.7	3.3	4.0	4.6	5.3	6.0	6.6	7.9
1	.8	1.2	1.5	1.9	2.3	3.0	3.8	4.5	5.3	6.0	6.8	7.5	9.0

TO USE TABLE:

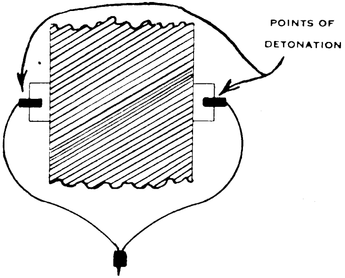
1. Measure rectangular sections of member separately
2. Using table, find charge for each section.
3. Add charges for sections to find total charge.
4. Never use less than calculated charge.

ADVANCED TECHNIQUE RULES OF THUMB

Improvised shape charge (Munroe)
1. Stand-Off - 1 1/2 times diameter of cone
2. Size - 2 times height of cone
3. Angle - 45 to 60 degrees
4. Detonation - exact rear center of charge

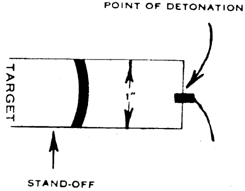


COUNTER FORCE



Counter force
1. Size - 1 to 1 1/2 lbs per foot of concrete
2 Placement - both charges exactly opposite each other and flush with target.
3. Detonation - simultaneous detonation in exact rear center of each charge

PLATTER CHARGE



Platter charge
1. Size - approximately 1/2 lb per inch of platter
2. Stand-off - approx equal to size of platter
3. Detonation - exact rear center of charge

U.K. CIVIL DEFENCE ASSOCIATION, "ALERT", No. 58, SEPT. '63.

FALLOUT IN FOOD

AFTER the explosion of a nuclear weapon there is a radioactive debris known as fallout, radiation from which can damage the living tissue.

The subject is controversial for two reasons. First, although we know for certain some of the effects of large doses of radiation, we know very little about the effects of continued small doses which is what we have as the result of nuclear testing. And, secondly, there is no agreement as to whether or not there are benefits which justify adding to the dose of radiation the human body already receives from other sources.

In the circumstances, we have decided to give here a summary of facts about radioactive substances in food, and the way in which the Agricultural Research Council (ARC) measures the changing amounts found in our diets as a result of nuclear tests. We hope that it will be of some guidance to members who consider the amount of radioactive substance in their food a matter for consumer interest.

The effects of radiation

The human body has always been exposed to radiation from natural sources—such as radioactivity in rocks and food, and cosmic rays—but, recently, man-made radiation has been added to the total to which we are exposed. This man-made radiation includes, among other things, radiation from the fallout of nuclear explosions.

Radiation in large doses, we know, can cause damage to living tissue. But our knowledge of small doses spread over a long period of time—which is what we get from fallout—is still limited.

For this reason, recent reports of the United Nations Scientific Committee and the Medical Research Council (MRC) on the effects of radiation both consider it prudent to assume that even the smallest doses may cause some harm, in a small number of people, in large populations. The smaller the dose, the smaller the number of people who may be affected.

The possible effects of radiation are of two kinds. When it is absorbed through the reproductive cells it can cause changes leading to hereditary diseases in *future generations*. When it is absorbed by other parts of the body any damage it can cause is to the *individual*. These effects—both on future generations and on individuals—can, of course, arise from other causes.

How radiation enters the body

Much the greater part of the dose from natural radiation penetrates the body from the outside. From fallout, however, much the greater part of the dose comes from the radioactive elements—strontium 90, caesium 137, iodine 131 and carbon 14—taken into the body in food.

Strontium 90 is chemically like calcium, so when eaten, it concentrates in newly formed bone, for example, the growing bones of children. The amount depends on its ratio to calcium in the total diet, as calcium dilutes the strontium 90. Once built into bone structure strontium 90, like calcium, remains there and irradiates the bone for many years. Because strontium 90 concentrates in the bone, the effect of its radiation is on the bone and bone marrow. This means that there is a possibility of an increase in the normal incidence of bone cancer and leukaemia.

Caesium 137 becomes widely distributed throughout the body, but only stays in it for a few months.

Carbon 14, which occurs naturally as well, also becomes widely distributed throughout the body. The radiation received from it in fallout each year is very much smaller than that from caesium 137, but it will continue to be a radiation hazard for thousands of years, because it takes 5,800 years for its intensity to fall to half.

Radiation from caesium 137 and carbon 14 (and, to a lesser extent, from strontium 90) may affect the reproductive cells, and hence increase the possibility of hereditary diseases. It may also affect the bone and bone marrow.

Iodine 131 concentrates in the thyroid gland, but its intensity quickly falls off. Very large doses of radiation have been shown to cause thyroid cancer, so it is possible that small doses might have the same effect. Iodine 131 concentration is greater in the smaller gland of babies.

Background radiation

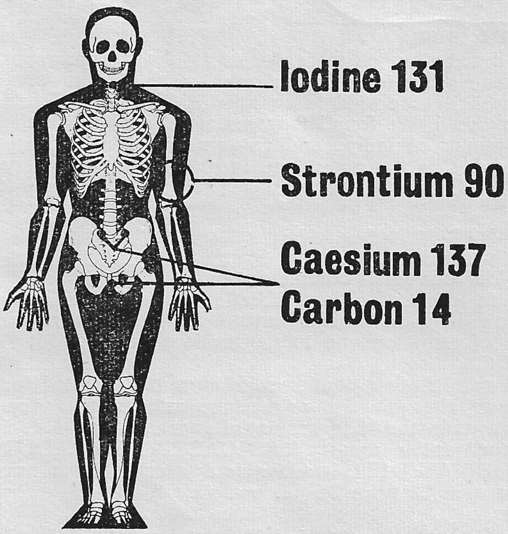
In considering the potential hazard from fallout, it should be seen in relation to the radiation man has always received from natural sources. The world average dose from the latter is about 120 - 130 millirems a year (a millirem is a measure of the effective radiation absorbed by living tissues). In addition, in this country, there is an average of about 20 milli-rems from medical radiology. During the five years 1955 to 1959, the average dose from fallout which could give rise to *genetic* effects was only about 2½ milli-rems a year. The tissues of *individuals* which received the highest doses in 1955-59 were new bone—about 10 milli-rems a year—and bone marrow—about 6 milli-rems a year; in 1961, the thyroid glands of some groups of babies received about the same amount as that from natural sources.

Radiation in Food

The International Commission on Radiological Protection has set maximum permissible levels for those exposed to occupational radiation hazards. For the population as a whole, one-thirtieth of these levels is recommended as a maximum.

For iodine 131, the MRC has specified a level of 130 pico-curies (a measure of intensity of radioactivity present) per litre of milk, averaged over the year, as being acceptable for any age group.

The radiation from strontium 90 in diet is assessed in terms of a 'working level', derived from recommendations of the MRC. This level, which incorporates an additional safety factor of two, is 130 pico-curies of strontium 90 per gram of calcium as an annual average for the population as a whole.



This level corresponds to a dose to a new bone of 90 milli-rems per year, which is similar to the natural background radiation in the U.K. (about 100 milli-rems).

It is considered that intakes at these levels are **BELOW** those which could cause an appreciable, detectable increase in the number of cases of cancer of the thyroid, leukaemia or bone cancer, in the population as a whole. It is not proposed to put any public health measures into operation while the amount present remains below these levels.

The monitoring of radioactivity in diet in the U.K. in relation to these levels is carried out by the Radiobiologcal Laboratory of the ARC.

— Caesium 137 and Carbon 14

Comparatively few measurements of caesium 137 in food are required as radiation from it can be directly measured in the human body. Radiation from carbon 14 can be directly inferred from the amount in the air.

The main hazard of these radioactive elements is a genetic one. No levels for these elements in diet have yet been set.

— Iodine 131

Iodine 131 mainly enters the diet in milk. The ARC measures the radiation from iodine 131 in samples of milk from a large number of depots all over the country at frequent intervals. Because the intensity of its radiation falls to half in as little as eight days, it is only found shortly after weapon testing.

Average countrywide figures of iodine 131 for 1961 and 1962 were:

YEAR	*Period present*	*Percentage of MRC level average over the year*
1961	*September — December*	*17*
1962	*August — December*	*15*

We understand that no appreciable amounts of iodine 131 have been found in milk during the first few months of 1963.

— Strontium 90

As strontium 90 is chemically similar to calcium the amount absorbed by bones is directly related to the proportion between strontium 90 and calcium in the diet.

The amount in the complete diet can only be worked out over a whole year as some crops are seasonal. A good indicator of the level at any time is, however, given by that in milk, since it has a strontium 90 to calcium ratio similar to that of the whole milk diet. Measurement of the amount in milk takes four to six weeks. Earlier indications are given from measurements of strontium 90 in air and rain.

The ARC survey covers milk collected every fortnight from 200 depots throughout the country, and imported cheese, root crops, green vegetables, cereal grain both home grown and imported, eggs and tea. Values for meat and fish need only be deduced as they contribute little calcium and strontium 90.

Countrywide average figures from fallout for the complete diet for the years 1958 to 1961 were as follows:

	1958	1959	1960	1961
Pico-curies of strontium 90 per gram of calcium	***5.9***	***9.0***	***6.4***	***6.2***

In some major regions of the country, where the rainfall is higher, the amounts were about half as much again.

It will be seen that these amounts are small compared with the 'working level' of 130 pico-curies of strontium 90 per gram of calcium in the diet.

Figures for the complete diet for 1962 are not yet available, but a good indication is given by the figure of 9.6 pico-curies of strontium 90 per grain of calcium for milk in the 12 months up to 30th September ,1962. This is slightly lower than the previous highest figure, in the year ending 30th September, 1959.

Changes of diet

Although milk contributes a large proportion of strontium 90 to the diet, variation in the amount of milk drunk has little effect on the intake, since the ratio of strontium 90 to calcium in milk is nearly the same as for the total diet.

Entirely abnormal changes in consumption of other foods would be needed to alter the ratio appreciably for the complete diet.

Publication of figures

Figures for radioactivity in food are published by the Agricultural Research Council in their annual Report issued each year around September. Interim reports and press statements are issued whenever it is considered necessary. In the autumn of 1961, during the period of considerable fallout of iodine 131, the ARC issued weekly figures to the press.

Figures for radioactivity in air and rain are published by the U.K. Atomic Energy Authority, and in drinking water by the Ministry of Housing and Local Government.

The Medical Research Council publishes reports on the levels of strontium 90 in bone. All these reports are available from H.M. Stationery Office and are usually commented on in the press, but often only briefly.

Anti-fallout sweets

There has recently been publicity for a product known as Ashodine anti-fallout sweets which claim to protect people from the effects of radioactive fallout. In particular, it has been reported that they reduce the intake of radiation due to strontium 90 and iodine 131.

Theoretically, the maximum effect of doubling the total calcium in the diet would be to halve the strontium 90/calcium ratio. But many experiments indicate that the actual effect may well be much less than this.

There is considerable evidence that additional stable iodine in the diet, in a single dose of about 100 milligrams (about 1,000 times the normal intake daily) can block the uptake of radioactive iodine 131 into the thyroid gland, if taken during periods when iodine 131 from fallout is present in milk. A much more satisfactory way of reducing that dose for young children, nursing and pregnant women during periods of high fallout, is for them to use dried or tinned milk instead of fresh.

(Continued on page 4)

EXAMINATION FOR CIVIL DEFENCE OFFICERS

At last someone has thought of providing a scheme of examination for Civil Defence Officers with a view to providing adequate means of testing fully the professional knowledge of Local Authority Civil Defence Officers or prospective officers.

The scheme has been inaugurated by the Association of Civil Defence Officers who have published a syllabus covering the orders of membership, i.e. Licentiates, Associates and Fellows.

The scheme is to be brought in to force as from 1st September, 1963, and from 1st January, 1967, admission to membership of the Association will be restricted to those who have passed the Association's examinations and who also satisfy all the other conditions contained in the Rules of the Association.

The period of studentship registration is five years from the date of admission, and candidates are normally expected to complete their examination within this period; an extension of time may, however, be granted by the Council at its discretion.

Registration confers no rank of membership but candidates are entitled to receive copies of the journal of the Association. A registration fee of £2 2s. is payable at the time of application.

It will be the responsibility of students to make their own arrangements in respect of tuition. The Hon. Examination Secretary will be prepared to advise Registered Students of the facilities which are available throughout the country.

Further information can be obtained from the Regional Representatives of the Association, or the Hon. Gen. Secretary, Mr. F. Raine-Allen, M.B.E., D.P.A., 55 Murray Road, Northwood, Middlesex, or from the Hon. Examination Secretary, Mr. W. T. Longley, A.C.I.S., 13 Fernhall Gardens, Kingston-upon-Thames.

FALLOUT:

What we found

The distribution of these sweets to shops appears to be extremely limited. We did manage to obtain some sweets which were sold to us as ASHODINE and had them analysed. We found they contained only about the same amount of iodine and calcium as some ordinary sweets made by the same firm. Further attempts to buy ASHODINE sweets were unsuccessful.

Conclusions

Strictly speaking, even the lowest levels of radiation cannot be considered completely harmless.

Current levels of fallout radiation in food are, however, low both in comparison to natural background sources of radiation and to the levels set by the MRC and ARC.

It seems, therefore, that there is currently no need for anyone to alter his diet or to take calcium or iodine supplements in the form of special sweets.

A much fuller report, RADIOACTIVE FALLOUT AND HUMAN DIET, is available as a pamphlet to any member of CA., price 2s. 6d. post free.

Editor's Note: This article has been reprinted from Which? *1963.* Which? *is published by the Consumers' Association and is obtainable on annual subscription of £1 for 12 monthly issues from 14 Buckingham Street, London, WC2.*

THE COUNTY OF LONDON C.D. COMPETITION FINALS

The County Finals of the Ambulance and First-Aid, Welfare and Rescue Competitions were held at Bully Fen, Hackney, on 29th June. The finalists were the survivors of 45 teams originally entered and the results were:

Ambulance and First Aid

Winners: Area 51D (Bethnal Green, Hackney, Stepney and Poplar)
Runners up: Area 53A (Camberwell, Lambeth and Southwark)

Rescue

Winners: Greenwich
Runners up: London Transport Board 'E' (Lillie Bridge Depot I.C.D. team)

Welfare

Winners: 1 — Lewisham
2 — Woolwich
3 — Bermondsey

The Chairman of the London County Council (Mr. A. Reginald Stamp, J.P.) presided over the Competitions and introduced the guest of honour, the Earl Jellicoe, D.S.O., M.C., Minister of State, Home Office.

In presenting the prizes, the Earl Jellicoe spoke appreciatively of the work done in Civil Defence, which reflected a voluntary but very worth-while surrender of volunteers' time and leisure. He stressed the continuing need and justification for Civil Defence. Until the Government's efforts, which were directed at the lessening of international tension, met with success Civil Defence was an essential part of the nation's security measures.

Should their efforts for peace fail the future would depend on the Civil Defence training and planning that could be, and was being done now.

HOME OFFICE

SCOTTISH HOME DEPARTMENT

Civil Defence Instructors' Notes

WARDEN SECTION

Functional and Supplementary Notes

LONDON

HER MAJESTY'S STATIONERY OFFICE

1960

PRICE 8s. 6d. NET

THE WORK OF THE WARDEN IN PEACETIME

The Warden War Book

19 The functions of a warden can only be carried out effectively if much preparatory work has been done in peacetime, but some of it cannot be undertaken until the government of the day directs it to be done. All information regarding the post area should be acquired systematically and recorded in a "Warden War Book", which is simply a name for a book containing information, lists, etc., valuable in wartime. The book would contain:

(*a*) A household register, giving the numbers of persons in each household in the area, together with particulars of handicapped persons, children and others in the priority classes for evacuation purposes, car-owners, etc.

(*b*) Names, addresses and telephone numbers of local officials, doctors, nurses, street leaders, etc.

(*c*) Notes of important buildings, factories, public utilities and other services, possible places for use as fall-out refuges, installations having special fire risks or other hazards, buildings which might be used as emergency rest or feeding centres, etc.

(*d*) Details of a scheme for posting fall-out warning notices and clearance of the area should it be in a highly radioactive zone. (The words "radioactive belt" are used in Scotland to avoid confusion with operational zones.)

(*e*) Details of a scheme for passing information to the public quickly, and especially in conditions of fall-out, for either clearance or release purposes.

(*f*) A scheme for organising self-help or stretcher bearers through street leaders.

Knowledge of Post/Patrol Area

20 Although information is recorded in the War Book, and on maps of the post area, and elsewhere, all wardens should have an intimate *personal* knowledge of the area. Conditions will vary somewhat, particularly in rural areas, but, as a general guide, wardens should know:

(*a*) The boundaries of the post areas and the patrol areas, and, where the post area boundary is also the sector boundary, the designation and location of the adjoining warden posts.

(*b*) The location of the Sector Post to which the warden post reports.

(*c*) The location of warden posts in his own Sector area.

(*d*) The nearest "home cover" fire and ambulance stations*.

(*e*) The nearest police station(s).

(*f*) The location of "first line" rest centres*, and buildings suitable for use as emergency rest or reception centres; and, similarly, of emergency feeding centres.

(*g*) High fire risks (e.g. petrol stores).

(*h*) Points of special operational significance (e.g. bridges, aqueducts, over-ground mains).

(*j*) Addresses of other wardens and members of the civil defence services in any particular patrol area (Senior Wardens and wardens).

(*k*) Nature of important industrial undertakings, and the operational arrangements between such undertakings and the Civil Defence Corps.

(*l*) The location of public shelters (if any) and how to obtain access to them.

PRACTICAL LESSON IN USE OF LIGHTWEIGHT RADIAC SURVEY METER

Notes for Instructor

1 The instructor should have, when available, a lightweight Radiac Survey Meter (0–100 r.p.h. scale). Until supplies of the operational instrument are available for training, the instructor will only be able to show a "mock-up" meter, but this can be roughly representative of the actual meter in size and has the correctly scaled dial reading from 0–100 r.p.h., although it has no switches or self-contained batteries, and it will be lighter in weight than the operational instrument. The "mock-up" meters from a locally constructed Battery Operated Radiac Trainer can be used, together with one or more complete trainer sets (instructor's control panel, five "mock-up" meters and wiring). The instructor should also put up on a blackboard or have available on a chart a series of typical dose-rate readings, building up to a fall-out maximum, levelling off, and then falling. He should also explain the logarithmic scale diagrammatically.

2 The class should be practised in taking and logging readings simulated on the five meters of the trainer, and in determining fall-out arrival (FOA) and fall-out maximum (FOM), using various protective factors (PF) to relate internal readings in a building to external dose-rates. The PF is the fractional difference between an external and internal dose-rate reading, e.g. if the reading outside were 10 r.p.h. and the reading inside were 2 r.p.h., the inside reading is 1/5th of that outside—a factor of 5.

Object of Lesson

3 To describe and teach the use of the lightweight Radiac Survey Meter and how to take and record radioactivity readings.

Description of the Lightweight Radiac Survey Meter (Operational)

4 The meter is a self-contained battery-operated instrument which is easy to carry and simple to use. It weighs only 2½ lbs. When switched on it detects the presence of fall-out and measures the rate at which radiation from fall-out is being received (i.e. the dose-rate) by means of a pointer moving across a scale reading from 0–100 r.p.h.

5 The instrument has two simple controls which are on the top panel and can be turned by hand. They are an ON/OFF switch, and a spring-loaded CHECK FULL SCALE switch to enable the user to check that the calibration is accurate. The instrument is normally self-calibrating and needs no re-setting for very long periods, but, if necessary, two simple pre-set screw adjustments can be made even in the presence of radioactivity up to a dose-rate of 100 r.p.h.

6 The dial scale is different from that of some instruments. The spaces between the readings are progressively less as the readings increase. It is easy to read provided it is remembered that each of the marks on the scale represents an increase of ·1 from 0–1, 1 from 1–10, and 10 from 10–100. The advantage of this kind of scale—called logarithmic—is that it enables accurate readings to be taken at the lower end of the scale, and at the same time to register high readings at the upper end. (See Appendix A.)

Taking Readings with the Meter (Explanation and Demonstration)

7 Wardens equipped with the meter are required to detect the arrival of fall-out (FOA) (see W 36). After a fall-out warning (or hearing, or seeing the flash of, a nuclear explosion)

Sector, Post and Senior Wardens should watch their meters in the open at five-minute intervals in order to detect FOA. (Fall out Arrival = FOA)

8 When fall-out arrives, Sector and Post Wardens will record the time of the fall-out arrival and they will then take and record readings every five minutes. They will continue to take external readings until the dose-rate reaches 3 r.p.h., at which they will retire inside the post to a spot where the instrument reads 0·3 r.p.h. (1/10th of the external dose-rate). They will then leave the meter switched on at that spot and go further inside the post to seek the best possible protection—returning to the spot every 10 minutes to take a reading. The time, the actual instrument reading, and the estimated external dose-rate should be recorded, e.g. 1010 hours; (1·5 r.p.h.): 15 r.p.h. (The instructor should emphasise that *reports* are always made in terms of the *external* dose-rate.)

9 If, however, the internal reading at this spot goes up to 3 r.p.h. (i.e. indicating an external dose-rate of 30 r.p.h.), the meter should be moved to a second spot where the reading goes down to 0·3 r.p.h., or the nearest approach to that figure. The ratio between the reading at the second spot and 30—providing no time is lost between taking the reading at the first spot and the reading at the second—will indicate the PF for this second spot. For example:

(*a*) if the reading at the second spot is 0·3 r.p.h., then the PF there is 100;

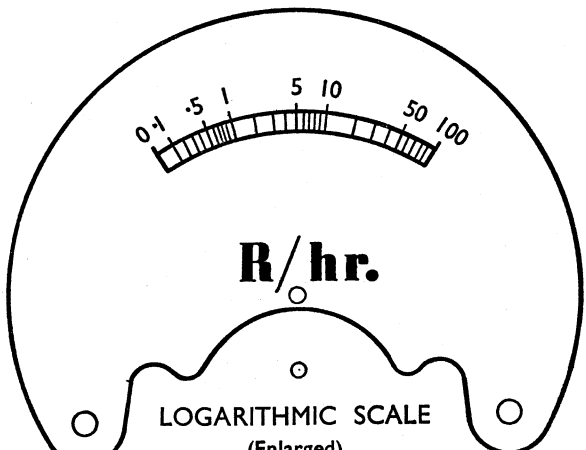
(*b*) if the reading at the second spot is 0·5 r.p.h., then the PF there is 60;

(*c*) if the reading at the second spot is 1 r.p.h., then the PF there is 30.

Any reading taken at the second spot will have to be converted to the external dose-rate by multiplying it by the appropriate PF.

APPENDIX A

DIAGRAM OF LOGARITHMIC SCALE
USED ON LIGHTWEIGHT RADIAC SURVEY METER



ESCAPE AND RESCUE FROM BURNING BUILDINGS

Notes for Instructor

1 Reference: Civil Defence Handbook No. 4, Elementary Fire Fighting.

2 Instructor requires:
- (*a*) Room with clear floor area on which to demonstrate and practise search of room, protection, if trapped, moving helpless person on level surface and dealing with a person on fire.
- (*b*) Suitable staircase to show and practise method of getting helpless person down it.
- (*c*) Low first floor window or wall to show method of escape.
- (*d*) Two helpers for demonstrating.

3 Period to be conducted as series of demonstrations with commentary, each demonstration being followed by practice by the class.

Object of Demonstration and Practice

4 To demonstrate how best, under fire conditions in a building, to find protection if trapped, to escape, to search for and rescue others from it, and to practise class in these methods.

Personal Protection

5 Two elementary principles. Wet cloth or handkerchief placed over mouth and nose gives some protection against smoke. If lost in room make for wall and continue round it in same direction till door or exit reached.

Escape

6 Air clearest and coolest near floor. Crawl with free hand raised in front to feel for obstructions. When using stairs keep close to wall, go down backwards feeling with foot for each step. Often possible to escape by dropping from a window on to the roof of an outbuilding, such as a wash-house or projecting kitchen, and so reaching the ground. Make certain that a "drop" can be made with safety—that something in the nature of a glasshouse or a railway line or cutting is not immediately below. If dropping from window, grip sill and lower self to full extent of arms, then let go and drop.

Rescue

7 It is advisable to work in pairs on entering smoke-filled room; make complete circuit of room, keeping close to wall, feeling under and on beds and inside cupboards; finally cross room diagonally to ascertain if anyone lying in centre. To move an insensible person, turn him on his back and tie his wrists together, kneel across him and place your head through loop formed by his arms; then crawl, dragging him with you. To move an insensible person downstairs, lay him on his back, head downwards on the stairs, place your hands under his armpits so that his head rests on the crook of your arm, then ease him gently downstairs.

8 *Clothing on Fire:* If another person's clothing is on fire, muffle in coat, blanket, curtain, etc., get on ground and roll over and over. Do not allow to remain upright, as flames lick upwards and produce serious burns of face and breathing passages. Do not hesitate to trip him up if he starts to run. If own clothing on fire clap hand over mouth, lie down and roll, using, if available, a mat, rug or carpet to roll up in.

Class Practice

9 On conclusion of each part of demonstration, the class, where necessary divided into pairs, practise the methods taught, instructor supervising.

Concluding Summary

10 The object has been to give practical instruction in the best methods under fire conditions of searching a building, taking protection if trapped, and escaping and rescuing others.

OTHER TYPES OF RESPIRATOR*

Notes for Instructor

1 Reference: Civil Defence Manual of Basic Training, Volume II, Pamphlet No. 1, "Chemical Warfare", Chapter IV and Appendix B.

2 The instructor requires:

(*a*) Chart giving list of respirators.
(*b*) One General Civilian respirator new design (C7) for instructor and one per individual.
(*c*) One sizing cone for instructor and one per individual.
(*d*) One Small Child's respirator (C2).
(*e*) One Baby Helmet respirator (C3).
(*f*) One Helmet respirator (C4).
(*g*) One Hospital respirator (C5).

NOTE: C1 = OLD 1937 - WW2 TYPE!

Object of Lesson

3 To demonstrate and describe types of respirator other than Civilian Duty respirator, and to explain variations in fitting procedure.

CIVILIAN RESPIRATORS:- C7, C2, C3, C4, C5:

Description of Various Types

4 *General Civilian Respirator, New Design (C7):* Has rubber sheet facepiece with two eyepieces of non-inflammable transparent material. An outlet valve with a dome-shaped cover is fitted on the left side. On the inside, running completely round the fitting surface, is a rubber tube containing air at atmospheric pressure; this is known as the fitting tube. Five sizes. Held in position by four adjustable tapes. Container secured by a strong rubber band. For fitting procedure and use of sizing cones see G 17(A), Appendix A.

5 *Small Child's Respirator (C2):* Has moulded rubber facepiece with container attached by screw joint. Two eyepieces and outlet valve. Head-harness of coiled springs enclosed in braid. Security device to prevent child removing facepiece. For children between 18 months and four to four and a half years.

6 *Baby Helmet Respirator (C3):* Is a hood of impervious fabric with large window, which encloses head, shoulders and arms. Closed round waist by draw tape. Supported on adjustable light metal frame. Air supply by bellows device.

7 *Helmet Respirator (C4):* Is loosely fitting hood of rubberised fabric secured under armpits. Two eyepieces. Air supply through container by means of bellows. Intended for persons suffering severe respiratory disabilities.

8 *Hospital Respirator (C5):* Is hood of impervious fabric with large window and skirt designed to lie on chest under bedclothes. Air supply by bellows device as for helmet respirator.

Concluding Summary

9 The object has been to demonstrate and describe types of respirator other than Civilian Duty respirator and to explain variations in fitting procedure.

* For Civilian Duty respirators see G. 17 (A), paragraph 24.

*Control of the Public in Radioactive Zones**

Notes for the Instructor

1 Reference: Manual of Civil Defence, Volume I, Pamphlet No. 2, "Radioactive Fall-out Provisional Scheme of Public Control", and Pamphlet No. 1, "Nuclear Weapons" (Second Edition, 1959).

2 The instructor should have a chart or blackboard drawing of a typical fall-out plume available, marked with the boundaries of W, X, Y and Z Zones. The colours used for zone boundaries should be:

(*a*) Zone W black.
(*b*) Zone X brown.
(*c*) Zone Y green. = BELOW 1000 R/hr at 1 hour after fission.
(*d*) Zone Z red. = 1000 R/hr at 1 hour or 10 R/hr at 48 hrs

3 He should also have a small scale map on which to indicate geographically how clearance of a Z Zone is effected (see Part III).

Object of the Lecture and Demonstration

4 The object is to explain the principles of public control in radioactive zones, and the procedure to be adopted in release and clearance of the public.

I—PRINCIPLES OF THE SCHEME

Fall-out Refuge—Requirements

5 Some protection against fall-out can be provided in normal dwelling houses, particularly if they are in a built-up area. Provided the windows are blocked with sandbags, or an equivalent, a ground floor room in a two-storey terrace house or a semi-detached house with walls of 13½ inches brick work, should give a protective factor (P.F.) of 40 against fall-out, i.e. the dose inside would be only one-fortieth of that in the open air. (See "Nuclear Weapons", paragraphs 9.21–9.23.) Larger buildings, and those with more substantial walls and floors (e.g. blocks of flats, factories, multi-storeyed tenements, etc.) will have a higher P.F., whereas isolated houses, small single-storeyed buildings, bungalows, etc., will have lower P.F's. Basements and cellars, where the radiation from fall-out outside the house has additionally to pass through considerable thicknesses of earth, have P.F's upwards of 200. Similarly, slit trenches covered with 2 or 3 feet of earth can have P.F's of more than 200.

For the purpose of control and safety, time spent in places with a minimum P.F. of 40 is referred to as "in refuge", and time spent elsewhere in a house or other place where there is a P.F. of not less than 10, is described as "under cover".

16 In a Z Zone the intensity of radioactivity (10 r.p.h. or more at H + 48) is such that the population can neither remain in it permanently, nor be cleared from it while the intensity is so great that it would be more dangerous to be in the open than to stay in refuge for a time. At some point in time subsequent to H + 48 everyone will have to be cleared from a Z Zone. The time at which clearance is to take place will have to be decided at Sub-region or Group, or even Regional (Zone control: Scotland) level, and the clearance effected by arrangements made at that level.

GEIGER CONTAMINATION MONITOR

15 *Purpose:* Main purpose is to detect and measure contamination due to radioactive fall-out which may be present on clothes or skin, particularly of casualties before hospital treatment. By interchanging probes, meter can be used for other purposes such as measuring radioactivity in water. Operationally, the probe can be fitted with a transparent plastic sheath where necessary, to protect it from contamination by radioactive material.

Radioactive Sources for Training

16 Radiac instruments referred to above will be used in conjunction with the following types of radioactive sources:

(*a*) Source, Radioactive, Type A—for testing dosimeters, training survey meter and contamination meter.

(*b*) Source, Radioactive, Type B—for use with contamination meter.

(*c*) Source, Radioactive, Type C—for use with training dosimeter and training survey meter.

(*d*) Source, Radioactive, Type D—for use with training survey meter out of doors.

(*e*) Source, Radioactive, Type G—for use in calibrating operational survey meters No. 1 and No. 2.

17 Containers for radioactive sources are designed to minimise risk during transport and storage of sources. They are coloured bright orange and lettered to denote type of source. Containers consist of three parts: (with the exception of Type G, in which the jig forms its own container):

(*a*) The source itself—a red painted capsule sealing in the active material at one end of a carrying rod. (*Note:* with type D source an extension piece is provided to lengthen the rod; but with type B, five disc shape capsules are loose, inside a carrying rod—they must be removed for use and may safely be handled.)

(*b*) Shield of lead to attenuate radiation from sources when not in use (types C, D and G only).

(*c*) Outer metal container.

Type A Radioactive Source

18 Small source of radium, for testing and checking training instruments. Will produce dose-rate of 0·5 milliroentgens per hour at one yard.

19 To make a correct check reading of the training type of individual dosimeter it is necessary to ensure that the ionisation chamber of the instrument is 3 inches from the type A source. If the dosimeters are set up on end, with the eye-piece upwards, against the inside of the rim of the standard container of the source, they will form a circle with a radius of 3 inches from the centre. The source itself, on its carrying rod, should then be mounted in its normal hole upside down, i.e. with the rod in the hole, red end upwards, with a rubber ring fitted around the rod, so as to leave the source and approximately 2 inches of the rod protruding from the hole. It will then be at the correct height to radiate direct into the ionisation chambers of the surrounding dosimeters.

20 *Testing training radiac survey meter:* To check training type radiac survey meter, place meter two yards from type A source. Immediate reading at this distance when meter switched on, should be about 125 microroentgens per hour.

21 *Testing contamination meter:* with contamination meter, if Type A source placed 13 inches from Geiger counter probe about 4 milliroentgens (i.e. 4,000 microroentgens) per hour should be recorded.

Type B Radioactive Source

22 Small source of radiocobalt for demonstration of detecting radioactive contamination using contamination meter. Intended to be hidden in personal clothing. Will produce dose-rate of about 0·16 milliroentgens (i.e. 160 microroentgens) per hour at one yard. Five of these small button-like sources are held in one container.

Type C Radioactive Source

23 Small source of radiocobalt for classroom use. One source placed a few inches from individual dosimeter of training type will produce half-scale deflection in one hour. With training type radiac survey meter, full-scale deflection produced at distance of between two and three yards. Will produce dose-rate of about 1·6 milliroentgens (i.e. 1,600 microroentgens) per hour at one yard.

Type D Radioactive Source

24 Medium source of radiocobalt intended primarily for outdoor demonstrations and exercises with training type radiac survey meter. Four such sources, suitably arranged at ten yard intervals, adequate for outdoor demonstration or exercise with radiac survey meter over walk of about 70 yards (see Appendix A). Will produce dose-rate of 7·8 milliroentgens (i.e. 7,800 microroentgens) per hour at one yard.

Type G Radioactive Source

25 Medium source of radiocobalt for use in calibrating operational survey meters No. 1 and No. 2. This source is held in a spherical lead shield jig which separates into two portions for use in accordance with the instructions given on a plate attached to the jig.

Hazards

26 Above sources give off gamma rays continuously. These rays even more penetrating than X-rays, but (as with X-rays) their effect is reduced by distance and shielding. Gamma rays harmful to living matter. Cannot be detected by ordinary senses and radiac instruments must therefore be used. Rays are injurious if they enter human body in excessive quantities, but small daily doses can be tolerated by normal person without harm. For scientific workers and others who are in daily contact with radioactivity this maximum daily tolerance dose is 0·1 roentgens (100 milliroentgens) per day or 0·3 roentgens (300 milliroentgens) per week and this is used for purpose of civil defence training. Much larger occasional doses would be accepted in war, however, especially as such doses would not necessarily be repeated daily but only when urgent needs dictated.

27 In ordinary training, size of sources are such that with suitable precautions the doses received will be harmless whilst still giving readable deflections on training meters; but it is essential to limit exposure by:

(*a*) Good discipline.

(*b*) Simple, unambiguous orders which are easy to remember.

(*c*) Reliable individual dosimeters (Trainer No. 1) which are well maintained and checked frequently against standard sources.

28 Since sources used for training are all in a sealed capsule or jig there is no need for protection against radioactive dust. No special protective measures need, therefore, be taken, other than mentioned below.

Advanced Training

FUNCTIONS OF OTHER SECTIONS AND SERVICES

WELFARE SECTION

1 The purpose of the Welfare Section is to assist local authorities to discharge their civil defence functions in respect of the evacuation, reception, billeting and emergency feeding of those who are evacuated under an official scheme, or who are rendered homeless as a result of enemy action. (E.G. IN AREA OVER 1000 R/hr FALLOUT AT 1 HOUR AFTER BURST)

Functions of the Welfare Section

2 At present, the Welfare Section is organised to deal with the following functions:

(i) *Evacuation and Care of the Homeless*

(*a*) *Evacuation:*
Helping with the registration and assembly of priority classes for evacuation, providing escorts, manning reception centres, and welfare of evacuees in billets and other special establishments, e.g. hostels or homes in reception areas.

(*b*) *Care of the Homeless:*
The general care in temporary accommodation of persons who, owing to hostile action or a threat of hostile action, are made homeless or leave their homes, or are refugees or persons repatriated from abroad, until such time as they can be billeted or otherwise rehoused.

(*c*) *Billeting:*
Helping with billeting of evacuees, homeless persons and other classes.

(ii) *Emergency feeding*

(*a*) Feeding the homeless in rest centres, reception centres and at other emergency feeding centres;

(*b*) feeding householders whose normal feeding arrangements have been disrupted through enemy action;

(*c*) feeding billeted persons who have no facilities for or who are unable to feed themselves.

Emergency feeding may also be required for refugees or persons repatriated from abroad.

Organisation (England and Wales)

3 The organisation of the Welfare Section is based upon a Welfare Section Centre which will be set up in each Sector area, and all members of the Section within the Sector area will constitute a company. The company will be broken down into parties. Where some members of a party are assigned to a particular task, they will constitute a detachment, under a Detachment Leader. The numbers in a detachment will vary according to the need. A Senior Welfare Section Officer will be in charge of the Welfare Section Centre and the company, and a Welfare Section Officer will be in charge of a party of that company.

4 The Welfare Section Centre should be set up as close to the Sector Post as possible (it might be in a Rest Centre if it were close to the Post) and there should be close co-ordination between the Senior Welfare Section Officer and the Sector Warden in all operational matters.